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ABSTRACT

Contained within this Health Activities Project (HAP) trial edition (set III) are a teacher information folio and numerous student activity folios which center around the idea that students in grades 5-8 can control their own health and safety. Each student folio is organized into an Overview, Health Background, Materials, Setting Up, and Activities section. Worksheets are also included for completing the activities for that particular folio topic. Examples of folio topics and activities include: using the yellow pages of a telephone directory to find health resources in the community, identifying habits that students would like to break and then monitoring progress in changing the habit, discussing the appeal of a product and using a variety of appeals to create personal ads, selecting lunch from a menu and assessing nutrients in the foods chosen. (CS)

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Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

HAP III

Trial Edition

[illegible]

SE 030 422

WHAT'S HAPpening?

IMAGINE . . .

Imagine that over a period of weeks you observe a group of young people. At various times they . . .

. . . compare the work load of different blood pressures on the heart and measure their own blood pressure.

. . . make plaster impressions of their teeth to gain a better understanding of the arrangement and function of teeth.

. . . wear particle masks and set out adhesive strips to monitor the air for dirt and dust.

. . . play a board game in which they try to balance their food intake with exercise.

. . . wear heat traps to measure the insulation effectiveness of different fabrics.

. . . design their own advertisements based on some of the hidden appeals in health product advertisements.

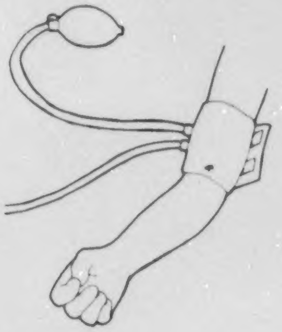
Each time you observe these young people, they are actively investigating how their bodies work and discovering how their decisions can affect their health and safety.

Are you wondering if you have been observing the efforts of a new experimental health clinic? Look again, because you could be watching your own class engaged in some of the activities from the Health Activities Project (HAP).

WHAT IS HAP?

The Health Activities Project (HAP) primarily involves fifth- to eighth-grade students with their own health and safety through hands-on, discovery-approach activities. By investigating their own bodies, the students learn firsthand how their bodies function, what their bodies can do, and, most importantly, that *they* can make changes in the way their bodies perform. HAP's main purpose is to make students more aware of the control they have over their own health and safety.

When do you use the activities? HAP activities have been designed primarily to supplement and enrich existing school programs in health, physical education, and science. Some of the activities have also been used successfully with a variety of other subjects, including music, math, and social science.



Is there any order to the HAP activities? The activities in this third set of HAP materials fall under four categories or areas of emphasis. We call these categories ***modules.*** HAP activities may be used independently, but work best when used in sequence within the module framework. Activities that *must* be conducted in a certain order contain the appropriate directions in their "Setting Up" sections.

DECISION MAKING
Module

Yellow Pages
Change a Habit
Habits Anonymous
Madison Avenue
Puzzling It Out

NUTRITION/DENTAL
Module

Lunch Time
Fat Chance
Jaws
Trouble Spots
Cavities

HEART/RESPIRATION
Module

Exploring Heartbeats
Exploring Blood Pressure
High Blood Pressure
Measuring Blood Pressure
Extra Weight
Measuring Lung Volume
Measuring Breath Volume
Gas Exchange

HEALTH SAFETY
Module

Fallout
Epidemic
Turn Around
Heat Traps

For trial purposes during 1978—79, we recommend that you present the activities in each module in the sequences shown above. The *modules* may be presented in any order you wish.

What about equipment? Along with the written materials, HAP provides an equipment kit. Most of the HAP III activities require special materials that are difficult to obtain. The remaining activities require only simple, easy-to-obtain materials and can therefore be conducted without a kit.

The commercial edition of HAP III activities and equipment will be available from Hubbard Scientific, 1946 Raymond, Northbrook, IL 60062, in 1980.

How do you lead a HAP activity? Your role as a HAP teacher is that of a facilitator (one who sets the stage) of learning rather than that of an instructor. Through many classroom trials we have found that, in many situations, discovery through student activity is more successful than someone else verbally conveying knowledge to students. The procedure that we suggest a facilitator follow is to quickly introduce the activity, demonstrate any special procedures and equipment, and present the students with the challenge or task. Most of the allotted time should be reserved for *student* exploration. Trust the *activity* to help your students learn through their own explorations. Then follow the activity with questions and discussions that reinforce the ideas introduced.

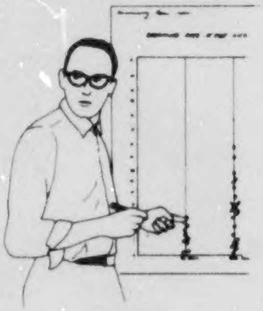
What do you do while the students participate in the activity? While your students work, you have the opportunity to move about the room and spend your time with individuals or small groups. You can participate, lend assistance when it is needed, help students record results, or ask questions that stimulate further activity.

AVERAGING THE DATA

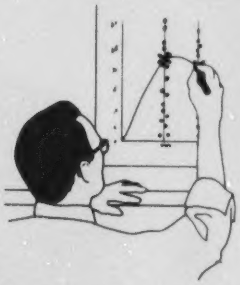
Activities Requiring this Technique Card:
Extra Weight
Measuring Breath Volume

The Technique. For most HAP activities, a simplified averaging technique is quite acceptable for chart data. We are looking for trends, not exact values. You need not delay the class while someone calculates a numerical average. Instead:

1. Place your finger at the top dot in any column of data.
2. Look at the class. *Do not look at the chart.*

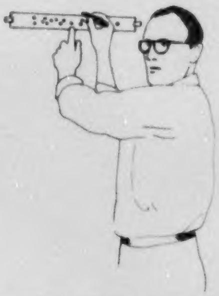


3. Tell the students to raise their hands when your finger reaches the *average* (the point that best represents all the dots), and to lower them if you go past that point.
4. Move your finger slowly down the entire column. Then move your finger back to the area where the most hands were raised. By moving your finger slowly up and down around this area, you will find the point that most accurately reflects the students' choice.
5. Use an eraseable crayon to mark that point with an X.
6. When appropriate, connect the average points in different columns to show a trend.



For Clarification. If the children have difficulty distinguishing between the arithmetic average and the middle or a clump of dots, try this technique.

1. Tape a piece of tissue or thin paper over a column of dots.
2. Trace the original dots onto the tissue.
3. Remove the tissue, turn it sideways, and tape it to the chalkboard.



4. Tell the students to pretend that the dot pattern is on a seesaw or balance board and the dots are objects of equal weight.
5. Ask them where you should place the support (fulcrum) so that the board would balance.
6. Mark that spot with an X.
7. Cover the original column of dots with the tissue again, and find out where the average would be on the original. Mark that point with an X.

Technique Card

DISINFECTING THE EQUIPMENT

Certain HAP activities feature materials that need disinfecting before they are reused by other students. In some activities there is enough equipment so that the materials may be *soaked* in the dilute-bleach disinfectant after the activity. In other situations, shared materials must be *wiped* with disinfectant before the next student uses the materials. Each folio informs you as to which kind of disinfectant station, if any, you will need.

WIPING STATION

Activities Requiring a Wiping Station:
Exploring Blood Pressure
Exploring Heartbeats
Measuring Blood Pressure

Materials:
1 pint of household bleach
1 bucket
paper towels*
water*

*Provided by the teacher.

What to do:

1. Make the dilute-bleach disinfectant by adding 2 capfuls (1 Tbsp.) of bleach to one gallon (4 liters) of water (preferably warm or hot) in a bucket.
2. Place the bucket and paper towels in an accessible classroom location.
3. During the activity, use a paper towel dipped in the solution to thoroughly wipe the parts of the equipment that contact the mouth, eyes, or skin.

SOAKING STATION

Activities Requiring a Soaking Station:
Gas Exchange
Jaws
Measuring Breath Volume
Measuring Lung Volume
Trouble Spots

Materials:
1 scrub brush
1 pint of household bleach
1 pint of household detergent
1 bucket
water*
sink* (optional)
paper towels*

*Provided by the teacher.

What to do:

1. After the activity, collect the used equipment in the bucket, and take the bucket, bleach, detergent, and brush to the sink area. (If you don't have a sink, disinfect the equipment in the bucket.)
2. Use the brush to scrub the equipment pieces in a sink or the bucket full of soapy waer.
3. Empty the water and, if you have a sink, rinse the equipment.
4. Make the dilute-bleach disinfectant in the bucket. (Use the same formula described in the "Wiping Station" section.)
5. Soak the equipment in the disinfectant for two to three minutes.
6. Dry the equipment and store it in clean plastic bags.

Technique Card

USING THE BLOOD PRESSURE EQUIPMENT

Activities Requiring this Technique Card:
Exploring Blood Pressure
High Blood Pressure
Measuring Blood Pressure

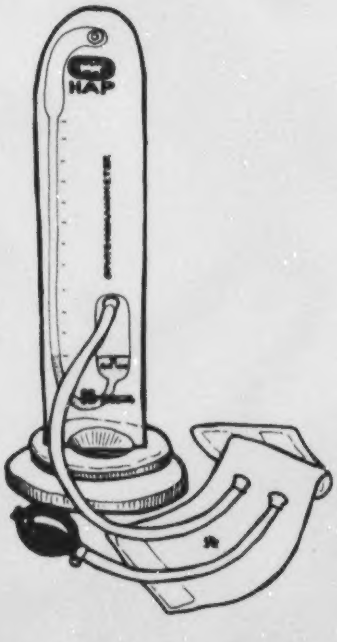
MATERIALS FOR ONE HAP SPHYGMOMANOMETER:
1 pressure gauge
1 long piece of tubing
1 short piece of tubing
1 cuff
1 bulb

ASSEMBLING THE EQUIPMENT

Preparing the Pressure Gauge

1. Insert the back of the pressure gauge into the slot in the base. Press down firmly on the gauge until it is completely in the slot.

2. Remove the plug from the red connector near the middle of the scale, and connect one end of the long tube to the connector.



3. "Zero" the pressure gauge by depressing the valve at the top of the scale while tipping the gauge sideways until the liquid level is even with the zero line. (The valve is the tiny rod inside the valve stem.) Release the valve.

- The valve should be depressed with a fingernail or a slender object so the valve stem is not completely closed off.
- Both temperature and atmospheric pressure changes affect the level of the liquid in the gauge, so instruct the students to check and rezero the gauge whenever necessary.

Connecting the Tubing and the Cuff

1. Connect the free end of the long tube to either of the connectors on the cuff valve.

2. Connect one end of the short tube to the remaining cuff connector, and the other end to the bulb.

Putting on the Cuff

1. The subject sits quietly with her forearm resting palm up on a table. Her upper arm should be bare and approximately at her heart level. Make sure that all the air is out of the cuff.

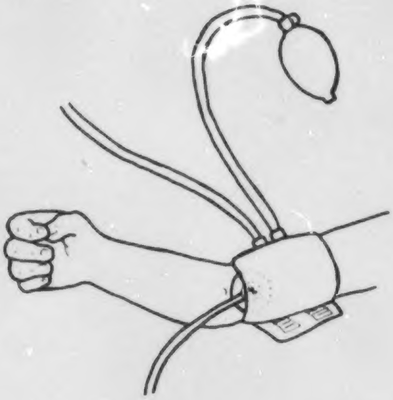
2. Position the cuff over the upper arm so that the HAP logo is centered above the inside of the subject's elbow. The lower edge of the cuff should just touch the inside of the elbow.

3. Wrap the cuff *snugly* around the upper arm, and secure the fabric strips.

Positioning the Stethoscope

1. Insert the stethoscope diaphragm between the cuff and the inside of the upper arm, with the black side of the diaphragm against the skin.

2. Make sure the diaphragm is centered directly underneath the cuff logo.

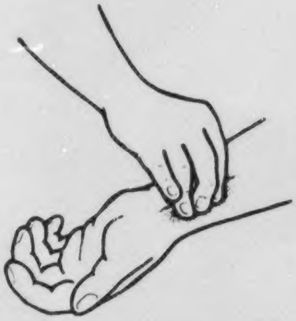


Taking the Pulse

1. Take your pulse at the wrist.

2. Arch the first three fingers on one hand and place the fingertips on your other wrist between the center of the wrist and the bone on the thumb side of your wrist.

3. Press gently so you do not stop the pulse by closing the artery.



MAKING MEASUREMENTS

Measuring Pressure

1. After the cuff has been properly fitted, close the valve on the bulb by turning it clockwise until it stops.

2. Pump the bulb until the column of liquid rises to the height you want. (If the fabric strips don't hold, have the subject press lightly on the cuff flap with her fingertips to hold it together.)

3. Proceed with your particular measurement.

4. After the measurement, release the pressure in the cuff by turning the valve counterclockwise.

CAUTION!

1. At no time should the cuff be inflated so that the liquid rises above 200!

2. No student should wear an inflated cuff for more than one minute!

3. The zero valve on the gauge should never be depressed while the cuff is pressurized!

Be flexible. Sometimes your students may become involved in exploration or ask questions that do not lead in the direction that you have planned. When this happens, be flexible. These situations can serve as interesting points of departure and often spur further exploration on the part of the students.

How do you lead the discussions? The discussion at the end of the activity is an opportunity for the students to compare discoveries, review the class results, and voice their experiences and opinions. Avoid monopolizing the discussion; act rather as a catalyst for discussion.

THE FOLIOS

Thoroughly acquaint yourself with the contents of the activity folio before attempting to lead the activity. Each folio is laid out in a similar format to make it easier for you to find the information you want as you move from activity to activity.

OVERVIEW

This section provides you with a capsule description of the activity.

HEALTH BACKGROUND

This section outlines the health significance of the activity and provides you with background information on the health concepts that the activity covers. ***Do not read this section to the students.***

MATERIALS

All materials for each activity are listed in this section. Materials to be provided by the teacher are marked with an asterisk. Such materials include easily obtainable equipment and duplicated Student Sheets. All other equipment is provided in the kit.

SETTING UP

This section outlines the activity's time requirements and what you have to do to get ready for the activity. Whenever possible, have your students assist you with the preparation.

THE ACTIVITY

Suggestions on introducing the activity, demonstrating any procedures and equipment, and carrying out the activity are found in this section.

This logo indicates parts of the activity in which the students are actively involved in their explorations.

Analyzing the Data

The questions in this section are designed to help students compare discoveries and review the results of the activity.

HEALTH APPLICATIONS

This section contains situational questions that are designed to "bring home" the health or safety significance of the activity. HAP recommends that you wait a day or two after finishing the activity before initiating these discussions.

HAP SIDETRIPS

These additional challenges may be used to extend the scope of the activity for the whole group or for interested students.

Note: Student Sheets, Equipment Cards, and Technique Cards unique to an activity are included in the particular folio. Technique Cards that are used in more than one activity are found in this folio.

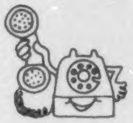
HINTS

Over the years we have discovered some general approaches that improve the flow of learning in the experiential science approach employed by HAP. You probably know and use some of these techniques already, but for those of you who are unfamiliar with the experiential approach, we mention them here.

1. **Equipment.** Make sure that all of the required equipment is present. Do not assume that equipment is in the box without checking first.
2. **Preparation.** Check the "Setting Up" section of the folio to find out what you have to do *before* you initiate the activity. For instance, in *Turn Around* the steering simulators must be assembled before the activity.
3. **Distributing the Materials.** Do not distribute the materials until you have finished the introduction and any demonstrations, and the students have been primed with a challenge and are ready to begin. If distributed earlier, equipment often diverts the students' attention from any instructions you may still have to give them.

4. **Interaction.** Hands-on discovery-approach activities generate a great deal of student-to-student verbal interaction. While participating in HAP activities, children often spontaneously exchange observations and ideas, so be prepared for higher than normal noise levels. This activity-oriented peer interaction is a valuable part of the learning process in HAP activities, so don't discourage it. You should, of course, keep it within reasonable noise limits, i.e., the children don't have to shout.

WE WANT TO HEAR FROM YOU



The HAP activities are trial editions; they are not finished products by any means. As a National Trial Center Teacher, you have received evaluation materials. Your specific comments on each activity that you use are extremely important to our revision process. We need to find out from you what works, what doesn't work, and how we can improve the activities. Each time you finish an activity, we would appreciate it if you promptly would fill out the appropriate evaluation sheet and send it to the director of your National Trial Center. Remember, you make it HAPpen! Thank you in advance for your cooperation.

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YELLOW PAGES

OVERVIEW

The students "go on a scavenger hunt" through the local phone directory to find health resources in the community.

HEALTH BACKGROUND

Health resources in a typical community include much more than hospitals and physicians. County health departments, fire departments, mental health professionals, clergy, and public libraries; private businesses such as health clubs and exterminators; and volunteer organizations like the Red Cross and the American Heart Association are just a few community health resources. Such organizations provide services or information that can help people achieve and maintain both physical and emotional health.

The telephone book is an excellent source to use in locating community health resources. Updated yearly, the phone book lists any resource that has a telephone. These books are readily accessible in most homes and at public telephones.

In this activity, the students practice their information-gathering skills and gain an awareness of the scope of health resources available in their own community.

MATERIALS

For each student:

1 "Important Numbers" card, from Student Sheet YP 2* (for HAP Sidetrip)

For each pair of students:

1 Student Sheet YP 1*

1 local telephone directory*

For the class:

1 "List of Problems for the Yellow Pages"

duplicator masters of Student Sheets YP 1 and YP 2

*Provided by the teacher.

SETTING UP

Scheduling the Activity

- Plan for 30 to 40 minutes for practice problems.
- Plan for 40 to 50 minutes for the Scavenger Hunt and the Speed Trials.

Preparing for the Activity

1. Collect enough phone books so that every two students can have a book.

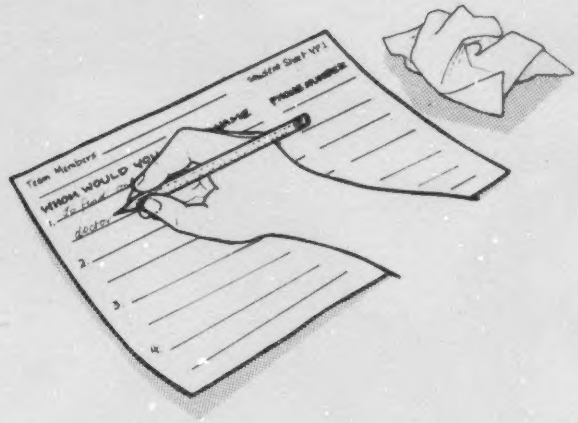
- Your phone company may be willing to give you enough books for your class.
- Each student could bring in an *old* phone book if new phone books have been distributed recently
- Another teacher in your school may already have obtained phone books for this activity.

2. From the "List of Problems for the Yellow Pages," select thirteen or more problems as follows:

- two practice problems for "Introducing the Activity,"
- six problems for the Scavenger Hunt, and
- five or more problems for the Speed Trials.

3. Prepare the duplicator master for Student Sheet 1 as follows:

- Remove the protective tissue paper.
- Write the six Scavenger Hunt problems on the dotted lines of the duplicator master.



4. Duplicate Student Sheet 1.

5. Duplicate Student Sheet 2, and cut the copied cards apart.

THE ACTIVITY

Introducing the Activity. Depending on the students' need for practice, use all or only some of the introductory problems below, or make up your own problems.

1. Give each pair of children a phone book.

2. Have the students look in their phone books for specific people and organizations. (See the samples below.) Make sure that partners take turns using the book and finding the answers. After each problem, have the students discuss how they found their answers.

- Suppose your mother is ill and needs you to call Dr. __________. (Give the name of a physician in your phone book.) Find his or her number in the book.
- You need to make a dentist appointment with Dr. __________.
- You need to call the Public Health Department to ask if they have a vaccination clinic.

3. Read to the class one of the practice problems you have selected from the "List of Problems for the Yellow Pages." Initiate a discussion of where to look in the phone book for answers to this problem.

- What resources can you think of right away to get help with this problem? (List these resources on the board.)

Team Members ______________________________

____

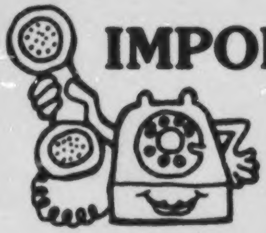
Student Sheet YP 1

WHOM WOULD YOU CALL?

WHOM WOULD YOU CALL?	NAME	PHONE NUMBER
1		
2		
3		
4		
5		
6		

Student Sheet YP 1

IMPORTANT NUMBERS



IMPORTANT NUMBERS

IMPORTANT NUMBERS

IMPORTANT NUMBERS

LIST OF PROBLEMS FOR THE YELLOW PAGES

Select six problems from this list, and write them on the duplicator master for Student Sheet 1. Also select two practice problems and five more problems for the Speed Trials.

Note: The headings on this list are merely for your convenience in selecting a variety of problems; they are not headings to check in the phone book.

INFORMATION

- To get information about the prevention of heart disease.
- To get information about birth control.
- To find out about sickle-cell anemia.
- To find out what the drug "digitalis" does.
- To find out what the disease "Muscular Dystrophy" is.
- To find out what to do after a dog has bitten you.
- To answer a question about a prescription.
- To find out how much protein is in a slice of bread.
- To find out where a doctor received his or her medical training.
- To find out what can be done about the restaurant that served you food with a dead fly in it.

EXAMINATIONS AND TESTS

- To get a physical exam.
- To get your blood pressure checked.
- To get an eye test.
- To get a hearing test.
- To get a TB skin test.

TREATMENT

- To get a measles vaccination.
- To get medical care if you can't afford a doctor.
- To get help if you are a problem drinker.
- To get help if you are extremely depressed.
- To get help if you think you might have a venereal disease (V.D.).
- To get help if you want to lose weight.
- To get help if you want to quit smoking.
- To get help when members of your family cannot get along with each other.
- To get a pair of crutches.
- For help in getting rid of rats.
- If you find a wild skunk in your basement.
- To get a prescription filled and delivered to your home.
- To get help when a tooth has been knocked out by a flying ball.

EMERGENCY

- To get medical care for the people involved in a car accident near your school.
- To get help when someone is having a heart attack.
- To get help when someone is stranded on a cliff.
- To get a sick person to the hospital fast, when you don't drive.
- To get help for a friend who is sick from a drug overdose.
- To get help when a little child swallows cleaning fluid.
- To get help when someone has stopped breathing and is being given artificial respiration.
- To contact the *nearest* hospital.

EDUCATION AND PROGRAMS

- To learn about first aid.
- To arrange to get more physical exercise.

- What word(s) could you look up to get ideas for other resources you may not know about?
- Under what word(s) would you find city agencies and county agencies that might help with the problem?

4. Assign different pairs of students to look up resources under different topical words. Give the students time to do their research.

5. Have the students share their findings.

6. **Optional.** Repeat steps 3-5 with a different practice problem.

Going on a Scavenger Hunt. Explain that in this scavenger hunt each pair of students receives an identical list of six problems. Their challenge is to find in the phone book the name *and* number of some person or place that would be able to help them with the six problems. Assure them that this task is *not* a race; they will have ample time to tackle the problems.

1. Hold up Student Sheet 1, and show the students the spaces in which they should write their answers.

2. Tell the students that each answer must meet the following requirements:

- It must state the full name of the resource, e.g. "Centerville Memorial Hospital," not simply "hospital."
- It must list a person's occupation as well as her name (if an individual is offered as a resource), e.g. "Dr. Jane Smith, Dentist."
- The resource must be able to provide the help specified in the problem, not just tell you where else to call. For example "the operator" or "my mother" would not be acceptable.
- The completed list should include no more than two doctors and one hospital as answers.

3. Divide the class into pairs of students. Give each pair a phone book and one copy of Student Sheet 1.

4. Allow enough time (about 25 minutes) for most of the class to finish their lists.

- Challenge the pairs that finish early to find and list a second *kind* of resource for each problem.

5. To show the students that there is usually more than one source of help for any problem, ask the students to share their answers to two or three of the problems.

Running Speed Trials. Tell the students that they are now going to complete Speed Trials.

1. Explain that in each trial you will read a problem to the class. Immediately, each pair of students should:

- find one answer to that problem as quickly as possible in the phone book,
- write the name and phone number on scratch paper, e.g. the back of Student Sheet 1, and
- raise their hands.

2. The first team to find a correct answer wins that trial. To be correct, an answer must meet the requirements stated earlier for answers to the Scavenger Hunt problems.

3. Using the problems you selected before class, conduct the Speed Trials.

- In each trial, record the teams that come in first, second, and third, and their answers. Teams that come in second or third may win the trial if the first team's answer is not correct.
- Have the class decide whether the first-place team's answer is correct. If not, have the class evaluate the second-place and third-place answers.
- If the class cannot agree on the correctness of an answer, you might have one student call the number in question to find out if the agency or person could help solve the problem.
- Depending on the students' interest, conduct five or more trials.

Analyzing the Data. Contrast the Scavenger Hunt with the Speed Trials, and then help the children consider the implications of these games for their health by asking questions such as:

1. What are some situations in which speed is not essential, but finding more than one source is important?

2. What are some situations in which you might have to find a number fast?

3. What might you do *now* to make sure that in an emergency you could phone for help as quickly as possible?

HEALTH APPLICATIONS

Imagine that you have new neighbors, an Australian family that has come to live in the U.S. for two years. The family consists of a high-school junior, a child your age, a two-year-old toddler, and the children's father, mother, and grandmother.

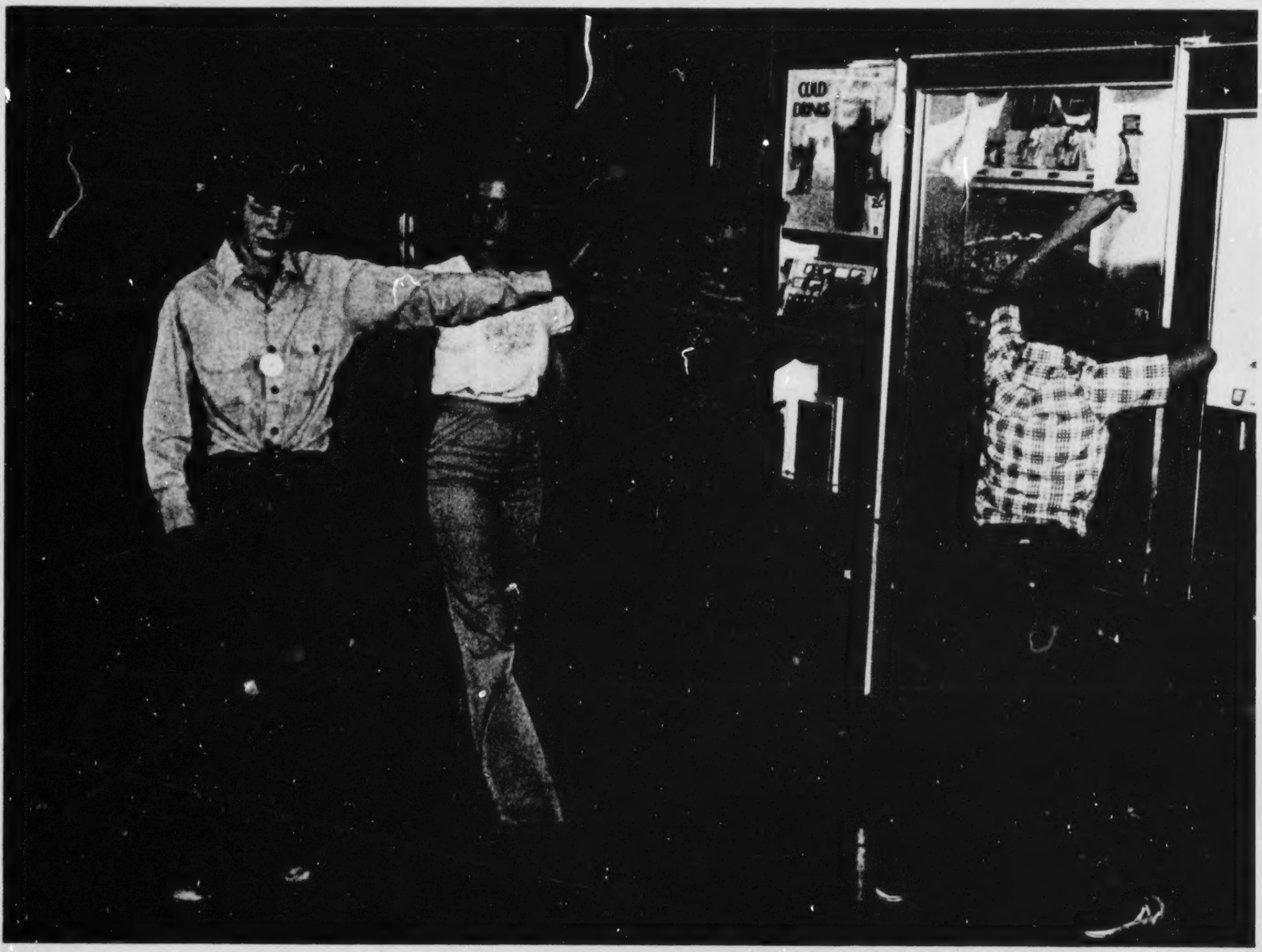
- What are some health resources that each family member might need to use?
- How many different ways could you help this family find out what health resources are available in your community?

HAP SIDETRIP

Distribute the "Important Numbers" cards to the students.

- Ask them what numbers they think are most important to put on this card.
- Have the students look up the numbers, write them on the cards, and take the cards home.
- Suggest to the students that they keep the cards by their phones.

CHANGE A HABIT



OVERVIEW

Each student identifies a habit he would like to break and then for one week monitors his progress in changing that particular behavior.

HEALTH BACKGROUND

Most of us have habits that are harmful to our health, such as smoking or overeating, that we would like to break. Habits are behavior patterns that we repeat frequently and often perform without thinking. Changing such patterns is often difficult. There are strategies, however, that people can use to break habits.

One strategy is to substitute a harmless action for the habit the person wants to break (e.g. drinking a glass of water when he has the urge to eat sweets). Another strategy involves keeping accurate daily records of the number of times one feels the urge to act out of habit.

In this activity, each student uses these strategies to break a habit. The students discover techniques to use in breaking unhealthy or undesirable habits.

MATERIALS

For each student:
1 small Habit Stopper, unassembled
1 safety pin
Student Sheets CAH 1, CAH 2, CAH 3, and CAH 4*

For the class:
1 large Habit Stopper, unassembled
ball of yarn or string*
1 "Habit Stopper" Equipment Card
duplicator masters of Student Sheets CAH 1, CAH 2, CAH 3, and CAH 4

*Provided by the teacher.

SETTING UP

Suggested Time: We suggest that this activity cover eight *consecutive* days.

- Plan for 50 to 60 minutes on the first day for Part One.
- Plan for five minutes on each of four days for Part Two. (The students work at home on the two weekend days.)
- Plan for 15 to 20 minutes for Part Three (the eighth day).

Preparing for the Activity

1. We have found that teacher participation enhances this activity. When the students select their habits to break, select one of your own that you wouldn't mind the students knowing about.

2. Assemble one small Habit Stopper to familiarize yourself with the materials and assembly procedure. (See the Equipment Card.)

3. Duplicate the Student Sheets. (It is a good idea to read over the Student Sheets before the activity, especially Student Sheet 3. This sheet describes what the students will be doing on their own.)

THE ACTIVITY: PART ONE

Introducing the Activity

1. Discuss habits by asking the students:

- What is a habit?
- What are some examples of health-related habits?
- Which of the examples are good (beneficial to health) habits? Bad (harmful to health)?

2. Ask the students to discuss people they know who have tried to break bad habits.

- How much effort was involved?
- How successful was the change?

3. Inform the students that research on habits has turned up several techniques that have helped people to break bad habits. In this activity, the students will try two of these techniques:

- substituting a harmless action for a bad habit, and
- keeping a daily record.

Selecting a Habit to Change. Student Sheet 1 is designed to help the students select the habit they would most like to change.

1. Give each student a copy of Student Sheet 1.

2. Explain how to fill out item 1. Tell the students:

- The survey is anonymous. Papers will *not* be collected.
- For those bad habits that you do not have, check the column labeled "I'm OK."
- The three blank lines are for any other habits you might like to break.

3. Have the students complete item 1.

4. Encourage each student to select one habit to break and to circle it on his Student Sheet.

- Those who do not want to break a health-related habit can select another habit that they would like to break, for example swearing or fiddling with jewelry.
- Explain that the habit-control techniques in this activity work best on actions that you take out of habit at least three times a day.

5. Give a brief pep talk, emphasizing that breaking habits can be difficult, but it is possible and worth the effort.

- The students will need motivation and confidence to succeed.

6. Distribute copies of Student Sheet 2, and let the students write out their goals and sign their names.

7. Tell the students that many people find breaking a habit easier if they substitute a harmless action for the habit rather than just

SURVEYING YOUR HABITS: CONFIDENTIAL!

1. What unhealthy habits would *you* like to break? Put a check in the column that best describes how you feel about your behavior in connection with these habits.

	I WANT TO CHANGE:			
HABIT	**I'M OK**	**SLIGHTLY**	**MODERATELY**	**VERY MUCH**
Eating more food than I need				
Eating between meals too often				
Drinkng too many soft drinks				
Eating too much sugary food				
Biting my finger nails				
Chewing on pens, pencils, etc.				
Smoking				

(The next three lines are for your own choices of unhealthy or undesirable habits. List them and check how you feel about them.)

2. From the list above, choose the *one* habit that you would like most to break, and circle it.

CONTRACT WITH MYSELF
(confidential)

For the Next Week, my goal is to break the Habit of

____

____

Whenever I feel the urge to ______________,
I will instead substitute one of the following:

____

____

____

____

____

Signed: ______________________

Date: ______________________

Name

Student Sheet CAH 3

RECORDING YOUR PROGRESS

How to Use the Habit Stopper:

1. To begin, turn both dials on your Habit Stopper to zero.
2. For the next seven days, starting now, keep your Habit Stopper with you at all times. Every time you feel the urge to act out of habit:
    - Turn the Urges dial to the next higher number.
    - If you *resist the urge* by substituting another action or doing nothing, turn the Progress dial to the next higher number.
    - If you *give in to the urge*, leave the Progress dial alone.
3. At the beginning of class each day:
    - Record the numbers showing on each dial of your Habit Stopper on the Daily Record below by coloring the proper number of squares in each column. (On the weekend, you will record your data at home.)
    - Return both dials to zero.

DAILY RECORD

URGES							PROGRESS						
15+	15+	15+	15+	15+	15+	15+	15+	15+	15+	15+	15+	15+	15+
15	15	15	15	15	15	15	15	15	15	15	15	15	15
14	14	14	14	14	14	14	14	14	14	14	14	14	14
13	13	13	13	13	13	13	13	13	13	13	13	13	13
12	12	12	12	12	12	12	12	12	12	12	12	12	12
11	11	11	11	11	11	11	11	11	11	11	11	11	11
10	10	10	10	10	10	10	10	10	10	10	10	10	10
9	9	9	9	9	9	9	9	9	9	9	9	9	9
8	8	8	8	8	8	8	8	8	8	8	8	8	8
7	7	7	7	7	7	7	7	7	7	7	7	7	7
6	6	6	6	6	6	6	6	6	6	6	6	6	6
5	5	5	5	5	5	5	5	5	5	5	5	5	5
4	4	4	4	4	4	4	4	4	4	4	4	4	4
3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1

Day*

*Write the abbreviations for the days of the week in these spaces.

HOW MANY TIMES DID I GIVE IN TO MY BAD HABIT?

Directions:

1. Write the abbreviations for the days of the week on the lines below and on the lines under the graph (the blanks marked "Day").
2. Record your daily Urges and Progress scores from Student Sheet 3 in the boxes below marked Urges and Progress.
3. Subtract your Progress score from your Urges score for each day. The result is the number of times you actually gave in to your bad habit each day.
4. Record this number on the graph below for each day.
5. According to your graph, is your habit . . . (check one) . . . ______ getting weaker?
______ staying the same?
______ getting stronger?

Day		______	______	______	______	______	______	______
	EXAMPLE							
Urges to act out of habit	10							
	minus	minus	minus	minus	minus	minus	minus	minus
Progress toward breaking habit	3							
	equals	equals	equals	equals	equals	equals	equals	equals
Times I gave in to my bad habit	7							

NUMBER OF TIMES I GAVE IN TO MY HABIT

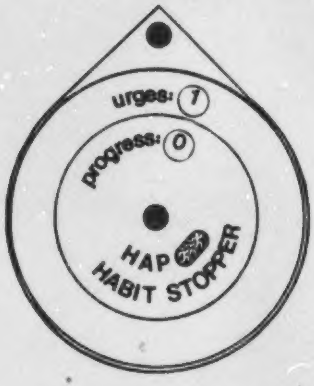
15+	15+	15+	15+	15+	15+	15+
15	15	15	15	15	15	15
14	14	14	14	14	14	14
13	13	13	13	13	13	13
12	12	12	12	12	12	12
11	11	11	11	11	11	11
10	10	10	10	10	10	10
9	9	9	9	9	9	9
8	8	8	8	8	8	8
7	7	7	7	7	7	7
6	6	6	6	6	6	6
5	5	5	5	5	5	5
4	4	4	4	4	4	4
3	3	3	3	3	3	3
2	2	2	2	2	2	2
1	1	1	1	1	1	1

Day* ____ ____ ____ ____ ____ ____ ____

*Write the abbreviations for the days of the week in these spaces.

Change a Habit
Equipment Card

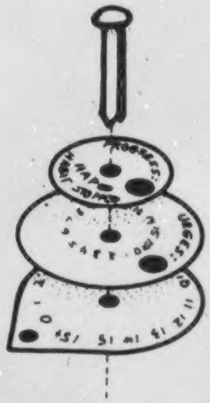
HABIT STOPPER



MATERIALS FOR ONE HABIT STOPPER:

1 backing dial (large disk with tab)
1 Urges dial
1 Progress dial
1 brass fastener
yarn or string* (optional)
safety pin (optional)

*Provided by the teacher.



ASSEMBLING THE HABIT STOPPER:

1. Punch out the three dials from the card.

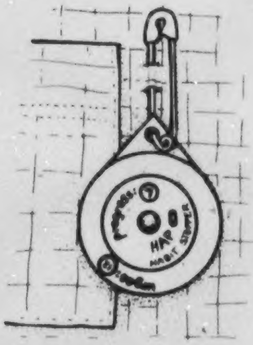
2. Punch out the black circles on each dial.

3. Stack the dials on top of each other (smallest on top, largest on the bottom).

4. Put a brass fastener through the center holes of the three disks and spread the arms of the fastener.

5. **Optional:** If you want to wear your Habit Stopper around your neck, thread a piece of yarn or string through the hole in the tab.

6. **Optional:** If you want to pin the Habit Stopper to your shirt or around a belt loop, put the tip of a safety pin through the hole in the tab.



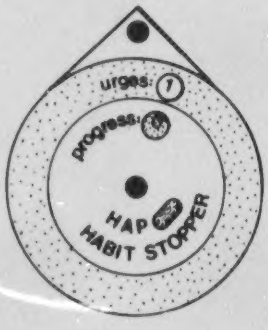
eliminating the habit. For this reason, Student Sheet 2 has spaces for listing substitute actions.

- Initiate a brainstorming session to generate behaviors that the students might substitute when they feel the urge to act out of habit.
- List all reasonable ideas on the board.
- Help the class generate a wide range of ideas (for example: counting mentally to five, chewing sugarless gum, drinking water, inhaling and exhaling slowly).

8. Allow enough time for the students to select their substitutions and write them on Student Sheet 2.

Demonstrating the use of the Habit Stopper and the Daily Record (Student Sheet 3). Tell the students that many people have broken bad habits by recording the number of times they act out of habit. Record keeping allows people to see their progress, which encourages them to keep trying.

1. Show the students the small Habit Stopper you have assembled, and introduce it as a convenient device for keeping track of the number of times one feels the urge to act out of habit *and* the number of times one gives in to the urge.



2. Give each of the students a Habit Stopper and show them how to assemble it.

- Demonstrate the procedure by assembling the large Habit Stopper step by step.
- Provide help as needed.

3. Distribute copies of Student Sheet 3.

- Using the large Habit Stopper, demonstrate steps 1 and 2 of Student Sheet 3.

4. Practice recording events on the Habit Stoppers with the class. For example, you might say, "Pretend that you want to break the habit of chewing on pens and pencils. Use your Habit Stopper to record the events that I am going to describe to you." (After each example below, discuss the correct new readings on the dials.)

- You feel like chewing on your pencil, but instead you chew a piece of sugarless gum. (Move the Urges dial to 1 and the Progress dial to 1.)
- During a test, you get the urge to chew on your pencil twice, and give in both times. (Urges 3, Progress 1)
- Without thinking, you put your pen between your teeth. You realize what you are about to do, and put the pen down. (Urges 4, Progress 2)
- You suddenly realize that you are chewing on your pencil. (Urges 5, Progress 2)

5. Go over Student Sheet 3 with the students, explaining the procedure they should follow for the next seven days.

THE ACTIVITY: PART TWO

Recording Progress

1. Once every day for the next four school days:

- Provide time for the students to transfer their Habit Stopper readings onto Student Sheet 3. They should then reset the dials to zero.
- Initiate a brief discussion of how the students feel about their progress, and what problems they are having.
- Give encouragement and moral support.

2. Over the weekend, the students should continue their recording at home. (Have them take Student Sheet 3 home.)

THE ACTIVITY: PART THREE

Analyzing the Data

1. First, have the students record their last day's data. Each student must have his completed Student Sheet 3.

2. Have the students inspect their "Urges" data on their Daily Record (Student Sheet 3). Ask the students:

- Has there been any change in the number of times you have the urge to act out of habit?
- What kind of change?
- Does this change mean that your habit is getting weaker, getting stronger, or staying the same?

3. Have the students inspect their "Progress" data.

- How did your progress results change over the seven days? (Help the students understand that a person successful in changing a habit will find his "Progess" scores decreasing after an initial high, because as urges dwindle, so do opportunities to score progress points.)

4. Distribute copies of Student Sheet 4.

- Help the students calculate and then graph the number of times they gave in to their habit each day.
- Record the number of students in each category on the board: habit getting weaker, staying the same, and getting stronger.
- Ask if the results show that record keeping and substitution help to change habits. (Not conclusively.) Why? (There was no control group for comparison, i.e., no other group of students who tried to break habits *without* using substitution and record keeping.)

HEALTH APPLICATIONS

1. If someone you care about is a smoker who wants to quit, how could you make it easier for the person to break the habit?

2. You know that habits can be difficult to break. What might you do to *prevent* yourself from developing unhealthy habits?

HAP SIDETRIPS

1. Challenge the students to continue using the Habit Stoppers and Student Sheets every day for several weeks. How do their long-term results compare with the first week's results?

2. Several weeks after the activity or after Sidetrip 1, ask the students to use their Habit Stoppers for 24 hours. Do the results for this one day, compared with the first day's results, show that they have made any progress in breaking their habits?

Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

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from the Robert Wood Johnson
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HABITS ANONYMOUS

OVERVIEW

The students monitor their progress in acquiring a habit, and find out how group support affects their progress.

HEALTH BACKGROUND

Groups such as Weight Watchers or Alcoholics Anonymous are comprised of people who want and/or need others to help them acquire better habits. The individual receives positive feedback in the form of praise, recognition, and other reinforcement from the group. Each time the individual makes progress in strengthening a habit, she receives motivation to continue with her new practices.

A group may also contribute to habit strengthening by providing negative feedback. In this case, a person would make progress in changing a habit in order to avoid negative consequences, such as a group's disapproval.

A person's efforts in acquiring a habit can be strengthened through either positive or negative feedback groups. In this activity, the students compare the effect of three conditions on acquiring a habit: positive feedback, negative feedback, and no feedback.

MATERIALS

For the Blue Group:

1 Student Sheet HA 1*
1 logo stamp
1 ink pad

For the Red Group:

1 Student Sheet HA 2*
1 red pencil*

For the Green Group:

1 Student Sheet HA 3* *for each student in the group*

For the class:

3 22-cm x 28-cm envelopes*
tape*
3 "Converting Progress Results to Percent Scores" Student Technique Cards*
duplicator masters of Student Sheets HA 1, HA 2, and HA 3
duplicator master of "Converting Progress Results to Percent Scores" Student Technique Card
1 "List of Habits"

*Provided by the teacher.

SETTING UP

Suggested Time: We suggest that you conduct this activity on five consecutive days, after you have presented *Change a Habit*.

- Plan for 50 minutes for Part One (Monday).
- Plan for 10 minutes on each of three days for Part Two (Tuesday through Thursday).
- Plan for 40 minutes for Part Three (Friday).

Preparing for the Activity

1. From the "List of Habits" select three health habits for your class.

- List these habits and the descriptions of what constitutes "Progress Made" and "No Progress Made."
- The habits you choose should provide a challenge; they should not be either widely practiced or impossible to acquire.

2. On each envelope, write "Progress Records" and one of the group colors (i.e., "Blue Progress Records," "Green . . .," "Red . . .").

3. Select three dynamic student leaders, one to lead each of the three groups.

4. Duplicate the Student Sheets and the Student Technique Card.

THE ACTIVITY: PART ONE

Introducing the Activity

1. Ask the students for examples of ordinary habits and health habits (e.g. chewing gum is an *ordinary* habit; drinking lots of water is a *health* habit).

2. Point out and discuss the benefits of each of the three health habits you have listed on the board. Ask the class to select one that, as a group, they presently do not have, but that they think would contribute the most to their good health.

3. Tell them that for the next week, they will meet daily to work on acquiring this health habit.

4. Define and discuss the difference between the "Progress Made" and "No Progress Made" descriptions listed on the board for the chosen habit. Tell the students that they will meet in specific groups to record their progress in acquiring this habit. Group Progress Records will be distributed each day for recording, and then collected and stored in the envelopes.

5. Tell the students that the activity outcome depends on two factors:

- secrecy between groups, and
- truthfulness among group members.

Organizing the Students

1. Randomly divide the students into three approximately equal groups designated as the Blue, Red, and Green groups. Make sure one of the preselected leaders is in each group.

2. Since you will be giving the groups instructions one at a time, tell the students who are waiting for instructions to read or work on other assignments.

3. Take each group out of the room, introduce the designated leader, and explain the group procedure.

BLUE GROUP **Student Sheet HA 1**

RECORDING PROGRESS

1. At each daily meeting, your group leader reads aloud the names of each group member.
2. When your name is called, you must call out "Progress Made" or "No Progress Made."
3. If your answer is "Progress Made," everybody applauds and your group leader should:
   - praise and congratulate you, and
   - stamp a logo by your name on this sheet.
4. If your answer is "No Progress Made," everybody will remain silent.
5. After everybody's name has been called, the leader counts the number of people, including himself, who have logos by their names.
6. Change this answer into percent by using the percent table.

NAMES	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
TOTAL NUMBER OF LOGOS				
PERCENT WHO MADE PROGRESS				

NOTE: If you miss even one opportunity to take the required action, you rate a "No Progress Made" score for the day.

RECORDING PROGRESS

1. At each daily meeting, your group leader reads aloud the names of each group member.
2. When your name is called, you must call out "Progress Made" or "No Progress Made."
3. If your answer is "Progress Made," everybody remains silent.
4. If your answer is "No Progress Made," everybody boos or scolds you and your group leader places a big red X by your name on this sheet.
5. After everybody's name has been called, the leader counts the number of people, including herself, who do not have big red X's by their names.
6. Change this answer into percent by using the percent table.

NAMES	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
TOTAL NUMBER *WITHOUT* RED X				
PERCENT WHO MADE PROGRESS				

NOTE: If you miss even one opportunity to take the required action, you rate a "No Progress Made" score for the day.

RECORDING INDIVIDUAL PROGRESS

1. At each daily meeting, you must write down your "Progress Made" or "No Progress Made" score on this sheet.

   Your Record Sheet should look like this:

NAME	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
TOM	PROGRESS MADE	NO PROGRESS MADE		

2. Fold this sheet in half, blank side out, and write your name on the outside.
3. Store your record in the envelope.
4. You must keep your results secret from everybody, including other members in your group.

NAME	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY

NOTE: If you miss even one opportunity to take the required action, you rate a "No Progress Made" score for the day.

LIST OF HABITS

Select three health habits from this list. Write the three habits as well as the description of what constitutes "Progress Made" and "No Progress Made" on the chalkboard.

Note: The habits on this list are only suggestions; feel free to add other potential health habits or to make up your own list.

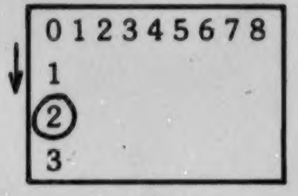
HABIT	PROGRESS MADE	NO PROGRESS MADE
WEARING A SEAT BELT	Each time I rode in a car I buckled my seat belt.	I did not buckle my seat belt when I rode in a car.
DENTAL HYGIENE	After each meal I brushed my teeth or rinsed my mouth with water.	I did not brush my teeth or rinse my mouth with water after eating.
DRINKING WATER	I drank at least three glasses of water yesterday.	I did not drink at least three glasses of water yesterday.
EXERCISING REGULARLY	I exercised for at least thirty minutes outside of school. (Note: You may want the students to decide on a specific exercise for group-consistent results.)	I did not exercise for at least thirty minutes outside of school.
CONTROLLING NERVOUS TENSION	Before I said or did anything when I felt nervous or worried, I practiced breathing slowly ten times.	I did not practice breathing slowly ten times after I became nervous or worried.

NOTE: If a student misses even one opportunity to take the required action, she rates a "No Progress Made" score for that day.

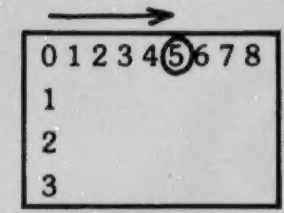
Habits Anonymous
Student Technique Card

CONVERTING PROGRESS RESULTS TO PERCENT SCORES

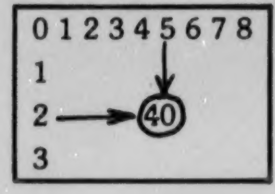
1. Count the total number of members in your group who made progress today, including your group leader.
   - Find this number in the column of numbers going down the table (for example: 2).



2. Count the total number of your group members who are in class *today*.
   - Find this number in the row of numbers going across the top of the table (for example: 5).



3. The *percent score* is the number located where the column and row meet (for example: 40).
   Note: Percentage is a useful method to use in comparing groups of unequal sizes.



PERCENT TABLE

TOTAL NUMBER OF MEMBERS IN YOUR GROUP

TOTAL NUMBER OF MEMBERS WHO MADE PROGRESS

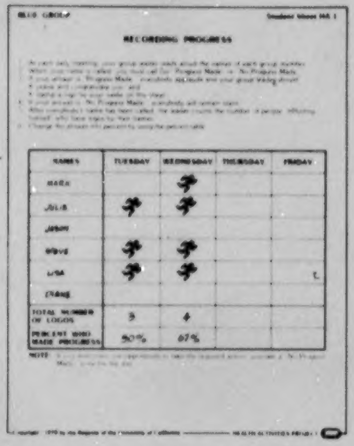
0	1	2	3	4	5	6	7	8	9	10	11	12
1	100	50	30	25	20	18	14	12	11	10	9	8
2		100	60	50	40	30	28	25	22	20	18	16
3			100	75	60	50	42	37	33	30	27	25
4				100	80	67	57	50	44	40	36	33
5					100	83	71	62	55	50	45	42
6						100	86	75	67	60	55	50
7							100	87	78	70	64	58
8								100	89	80	73	67
9									100	90	82	75
10										100	91	83
11											100	97
12												100

Procedures for the Blue Group

1. Give the leader Student Sheet 1, the logo stamp and ink pad, the "Blue" envelope, and a Technique Card.

2. Explain that the group will meet daily and privately to record group progress in acquiring the selected habit.
   - At each meeting the group leader reads aloud the name of each group member.
   - As each name is called, that member calls out "Progress Made" or "No Progress Made."

3. If a member's answer is "Progress Made," everybody applauds and the leader:
   - praises and congratulates the member, and
   - stamps a logo by the member's name on Student Sheet 1.



4. If a member's answer is "No Progress Made," everybody remains silent.
   - Make sure the students understand that they are only giving praise for progress made.
   - Group members should not chide another member for failing to make progress.

5. Before returning to the classroom, explain how to convert the group progress results to a percent score. (See the Technique Card.) Tell the students that they will make this computation each day after all of the group members have been polled.

Procedures for the Red Group

1. Give the leader Student Sheet 2, the red pencil, the "Red" envelope, and the Technique Card.

2. Explain the same roll call procedure used with the Blue Group (step 2).

3. If a member's answer is "Progress Made," everybody remains silent. *No praise is given.*

4. If a member's answer is "No Progress Made," everybody boos or scolds him, and the leader places a big red X by that person's name on Student Sheet 2. Make sure the students understand that they are only expressing disapproval when no progress is made; they must not praise students who make progress.

5. Before returning to the classroom, explain the percent conversion process and the daily computation required.

Procedures for the Green Group

1. Give the leader the "Green" envelope.

2. Distribute and explain Student Sheet 3. Tell the group members to keep their results secret from everyone, including other members of the group.

THE ACTIVITY: PART TWO

Measuring Group Progress

1. For the next three days, have all three groups meet separately (out of sight and hearing from each other) to complete their tasks. (The Red and Blue groups will record their progress and compute their percentages; the Green group only records their progress.)

2. Remind each group to be secretive.

THE ACTIVITY: PART THREE

Measuring Group Progress

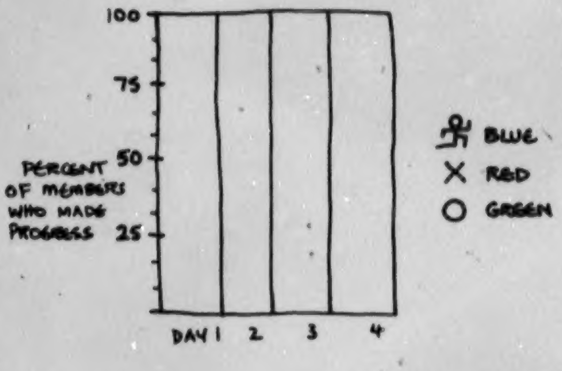
1. Have all three groups meet separately to complete their tasks.

2. When the Green group meets, show them how to tape their record sheets together to make a group record. Give them a Technique Card, and show them how to convert their group results to percent scores.

Analyzing the Data

1. Ask the students from each group to describe what their group did. How did the students feel when they received a logo? A big red X? Praise? Criticism? No reaction?

2. Which group do they predict will show the most progress? Poll the students, and write their predictions on the board. Make the illustrated chart on the board, graph the progress of each group, and compare the predictions to the actual progress.



- How did the predictions compare to the results?
- Is it fair to compare the progress of the three groups? Why?
- How helpful was it for you to belong to a particular group?
- Do you find it easier to acquire a habit by yourself or with a group that provides feedback?
- What is the difference between encouragement and nagging? Between nagging and criticism?
- What conclusions can you draw from the results?

3. The discussion should bring out several points:

- Depending on the person, either positive or negative feedback can strengthen one's resolve to acquire a habit.
- Acquiring a habit can be strengthened without group feedback. (Green Group showed progress.)
- The best method for each person is the one that works for him—there is no *one* right way to acquire a habit.

HEALTH APPLICATIONS

Suppose you are playing in a baseball game. The fans are cheering and yelling at you and the other players.

- How would fans who kept calling you a bum affect your playing?
- How would you react to fans who were encouraging you?

HAP SIDETRIP

What health habit do you think your family might like to acquire?

- Take Student Sheets 1, 2, and 3 home, and tell your family about your experience in class.
- Challenge them to acquire a new health habit. Have them decide whether they want *positive, negative,* or *no* feedback.
- Every day, have your family meet to record their progress.

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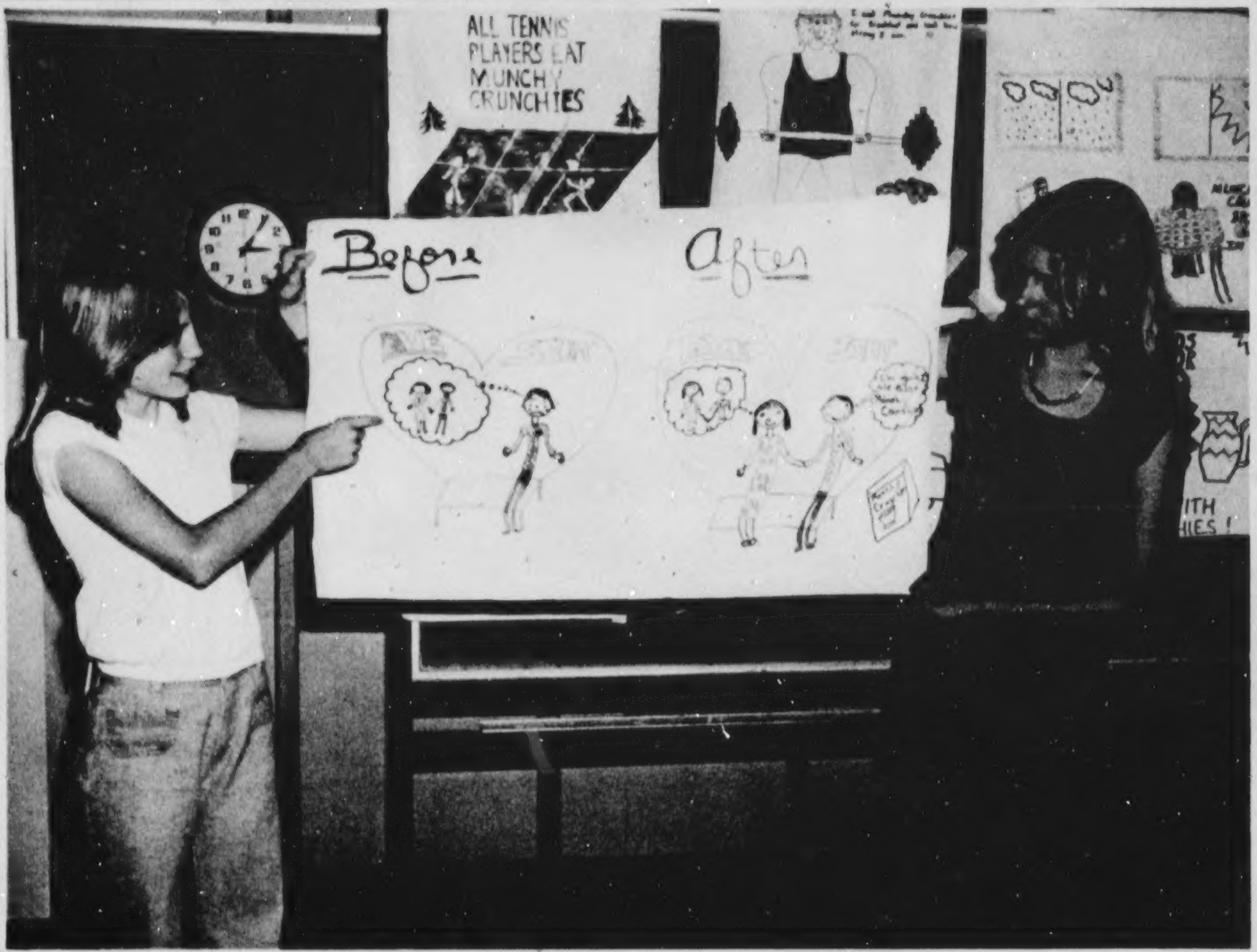
MADISON AVENUE


ALL TENNIS PLAYERS EAT MUNCHY CRUNCHIES
Before
After

OVERVIEW

The students discuss the appeal of a product, and then use a variety of appeals to create their own ads.

HEALTH BACKGROUND

New health products are continually appearing on the market. Advertisements for these products claim to provide anything from pain relief to daily nutritional needs. Ads are designed to appeal to consumers on a variety of levels, from sex to emotional security.

Young people are a prime target for advertisers. This activity is designed to help young people develop more discriminating attitudes towards ads by examining some of the techniques used in ads to appeal to consumers. A knowledge of advertising practices may help young people make more informed decisions about health products.

MATERIALS

For each student:
1 Student Sheet MA 1*

For each pair of students:
1 Appeal Card* (from Student Sheet MA 2)

For the class:
sample advertisements*
art materials*, including crayons or colored pens, scissors, butcher paper (30 cm x 50 cm)
1 Appeals Chart
duplicator masters of Student Sheets MA 1 and MA 2
* Provided by the teacher

SETTING UP

Suggested Time:

- Plan for 30 to 60 minutes for the introduction.
- Plan for one to two hours for making the ads.
- Plan for 30 minutes for discussing ads.

Preparing for the Activity

1. Bring the class five or six magazine advertisements that demonstrate some of the appeals listed on the Appeals Chart.

2. Post the Appeals Chart.

3. Duplicate Student Sheet 1.

4. Duplicate Student Sheet 2, and cut apart the copied Appeal Cards so you have one card for each pair of students.

THE ACTIVITY

Introducing the Activity

1. Initiate a discussion about advertising by asking the students to share some ads they have heard or seen (i.e., breakfast cereal boxes, billboards, TV ads).

- What age group was the ad designed for?
- How did the advertiser try to entice the consumer to buy the product (humor, sex appeal)? Refer to the Appeals Chart as necessary.

2. Show the students the ads you have brought in, and have the class discuss the various appeals the ads make.

No breakfast is nutritious until somebody eats it.
The cereal that's a natural
The kind of food 9 out of 10 pediatricians prefer.
A BREAKFAST WITH HIGH NUTRITION
MORNING BREAK. FAST.
"The Fruit and Cereal Lover's Cereal"

3. Read the Appeals Chart to the class. Have the students:

- suggest other appeals to add to the Appeals Chart, and
- give examples of each appeal (to make sure they understand it).

4. Distribute the copies of Student Sheet 1.

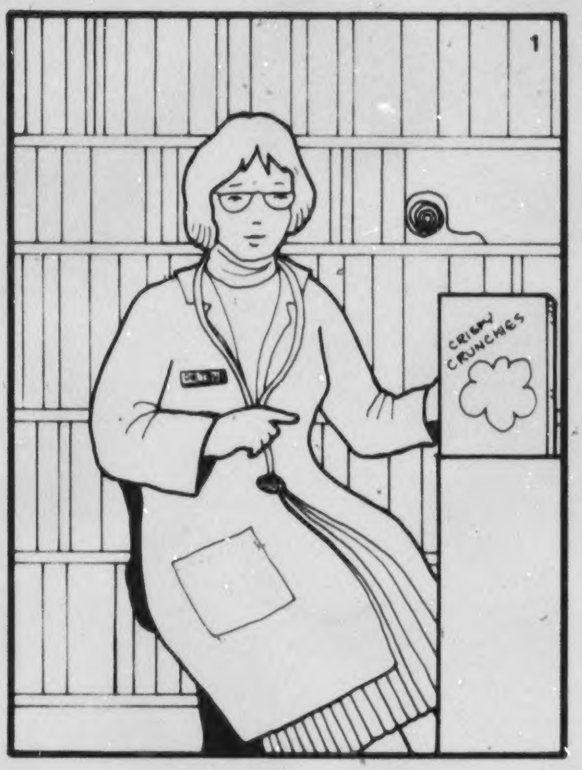
- Explain that the ads are for a new cereal called Crispy Crunchies.
- Read the cereal description to the class: "New Crispy Crunchies . . . a light, whole-grain cereal with a crisp, crunchy taste that supplies you with 100% of the RDA (Recommended Daily Allowance) of vitamins and minerals."

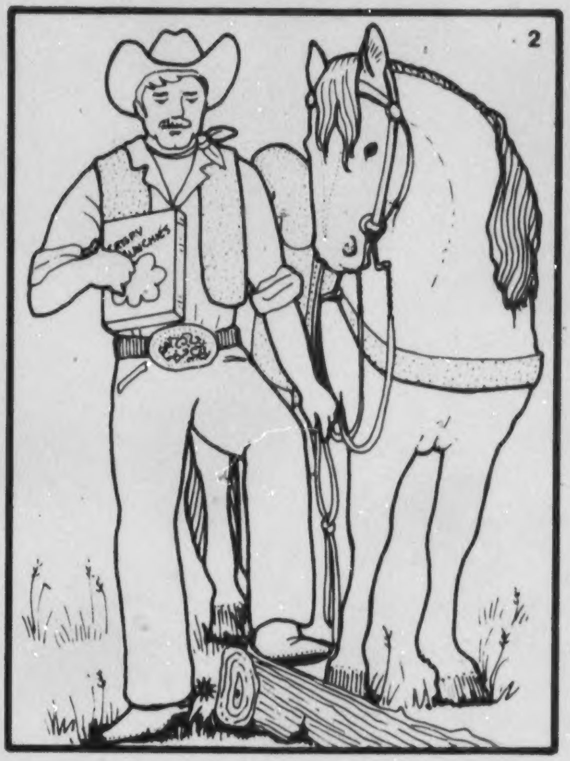
5. Have the class look at picture #1 on the Student Sheet (the woman doctor). Ask the following questions:

- What characteristics do you expect the person in the picture to have? (Responsibility, intelligence, etc.)
- What characteristics do you think a person who likes this ad would have?
- What group does this ad appeal to?
- Who would ignore this ad?
- Who would dislike this ad?
- Would you believe the person in the ad? Why or why not?
- Which of the appeals on the chart does this ad use?

LOOKING AT ADS

Student Sheet MA 1


1
CRISPY CRUNCHIES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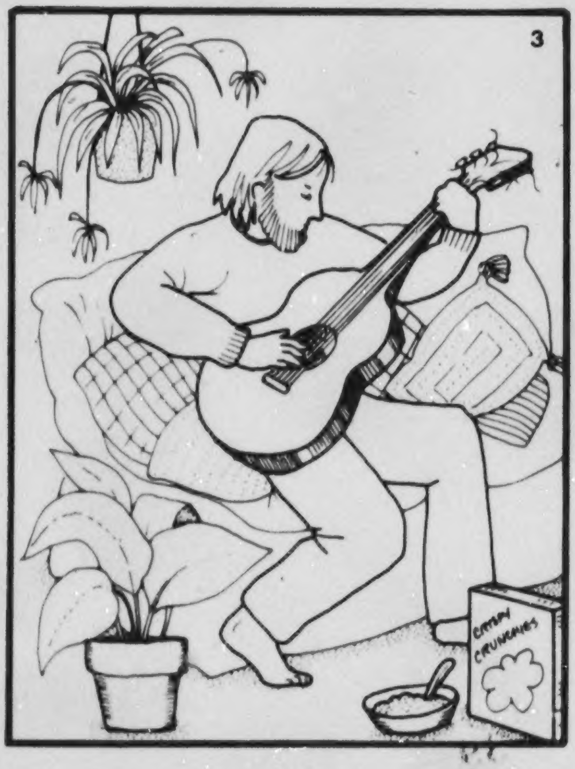
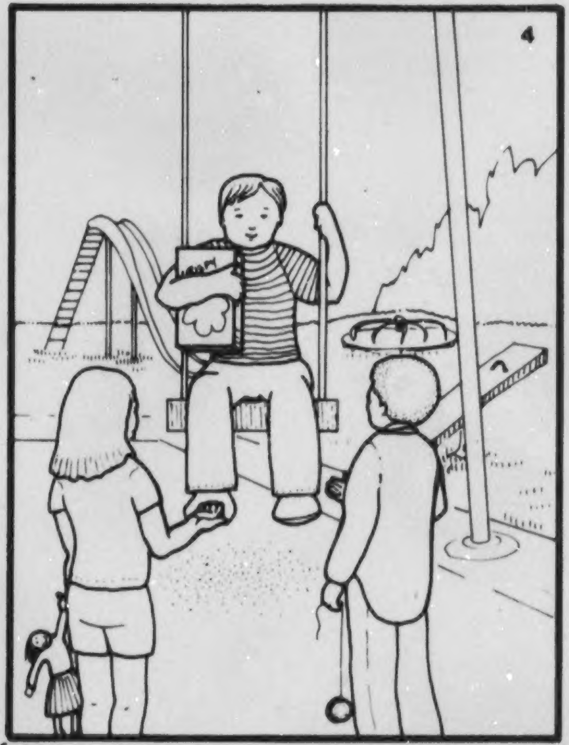
CRISPY CRUNCHIES


3
CRISPY
CRISPY CRUNCHIES



APPEAL CARDS

***Madison Avenue* APPEAL CARD**

FAME: Use a famous person in your ad to sell Crispy Crunchies.

***Madison Avenue* APPEAL CARD**

SEX APPEAL: Use sex appeal to sell Crispy Crunchies.

***Madison Avenue* APPEAL CARD**

YOUTH APPEAL: Make your ad appeal to your age group.

***Madison Avenue* APPEAL CARD**

BAND WAGON: Make people want to be part of the crowd that eats Crispy Crunchies.

***Madison Avenue* APPEAL CARD**

STATISTICS: Use statistics to sell the product.

***Madison Avenue* APPEAL CARD**

SNOB APPEAL: Make people think that they will be part of an elite group if they eat Crispy Crunchies.

***Madison Avenue* APPEAL CARD**

HUMOR: Make people laugh with your Crispy Crunchies ad.

***Madison Avenue* APPEAL CARD**

HAPPY-FAMILY APPEAL: Make people think of happy families when they see Crispy Crunchies.

***Madison Avenue* APPEAL CARD**

TESTIMONIAL: Offer a testimonial for Crispy Crunchies from a mother.

***Madison Avenue* APPEAL CARD**

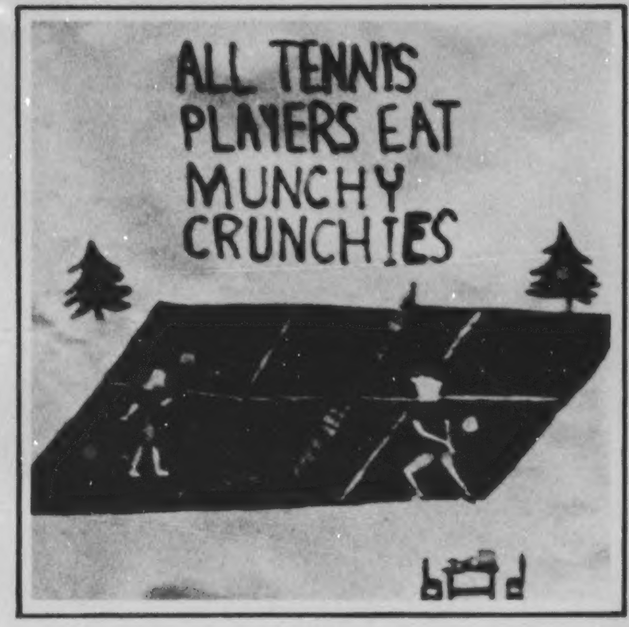
HEALTH APPEAL: Appeal to a person's concern for his or her health.

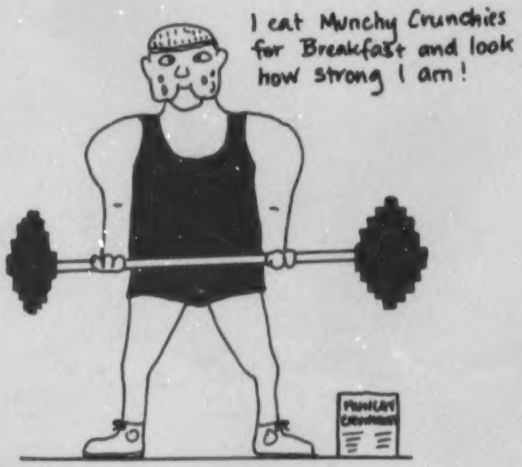
6. Discuss all four pictures in this manner.

7. Ask different youngsters which ad appeals to them. Why?

Designing Advertisements

1. Let the students pair up.
2. Give each pair of students an Appeal Card.
3. Have the students collect their art materials and design their ads, following these instructions:
   - Your ad should use the appeal on your Appeal Card.
   - Keep your appeal a secret. Later, the class will try to guess which appeal your ad uses.
   - Be as imaginative as you can.
   - Your ad should be big enough to be seen across the room.
   - Write your appeal on the back of your ad.
4. Circulate to assist students.


ALL TENNIS PLAYERS EAT MUNCHY CRUNCHIES


I eat Munchy Crunchies for Breakfast and look how strong I am!

Sharing the Results

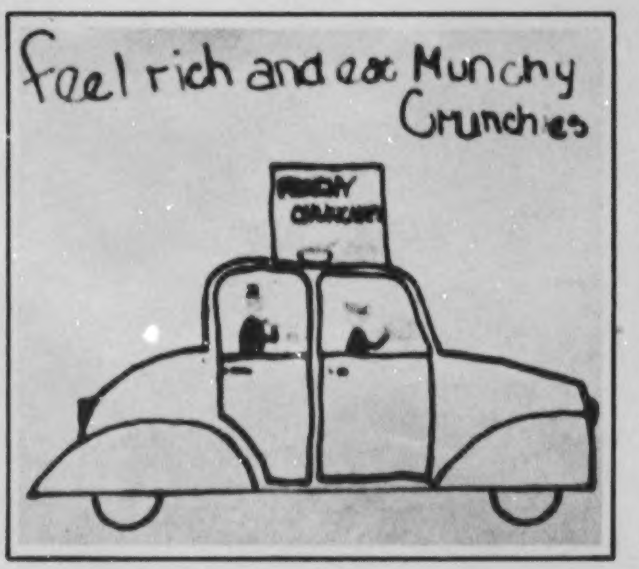
1. Ask for volunteers to present their ads.
2. Have the class guess what each ad's appeal is.
   - What part of the ad is a clue to the appeal?
   - Have one student from each pair read their Appeal Card and explain how the ad makes the appeal.
   - What other ways could the same appeal have been made?

HEALTH APPLICATIONS

1. You have a cold and need to buy a non-prescription decongestant. Three brands are advertised, a twelve-hour capsule, a four-hour liquid, and a nasal spray. How do you decide which one to buy?

2. As health products gain more popularity, new ads for health products are appearing continually.

- What health products do you frequently see advertised?
- What appeals do advertisers use for these health products?
- Which health product ads are most convincing? Why? Least convincing? Why?
- What information do ads for health products give you? Study magazine ads from magazines brought to class or found in the library.


feel rich and eat Munchy Crunchies
MUNCHY CRUNCHY

HAP SIDETRIPS

1. Compare the ads for aspirin (or some other product) sold under a trade name with ads for aspirin sold under its generic name (just plain aspirin).

2. Write captions or songs for the Crispy Crunchies cartoon ads (Student Sheet 1).

3. Bring in ads that use the same appeal you used for the ad you designed in class. Also bring in ads that each use a lot of different appeals.

4. Develop an advertising campaign for a new product you have designed. Use as many appeals as you can to reach as many people as possible.

MUNCHY CRUNCHY

Health Activities Project
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PUZZLING IT OUT

OVERVIEW

The students ask questions to find out which of two skateboards is the best buy and to earn enough puzzle pieces to assemble a puzzle.

HEALTH BACKGROUND

In our consumer-oriented society, many models of the same product are available. The decision on which model to purchase is based on a variety of factors, including price, appearance, and advertisements. Safety features are particularly important, but consumers often overlook these features when making a purchase. Considering that accidents are the major cause of health problems of young people, however, safety features assume special importance in products designed for young consumers.

In this activity, the students attempt to gain enough information to decide which of two skateboards is a better buy. The number of puzzle pieces they are awarded for each question they ask is an indication of how useful the information is. (Safety-oriented questions earn more puzzle pieces.) When a team completes their puzzle, they can be sure that they have obtained enough information to make an informed purchasing decision.

MATERIALS

For each group of five:

1 Model-A puzzle packet (20 pieces)
1 Model-B puzzle packet (20 pieces)
1 "Rules for the Question Askers"
1 "Skateboard Quality Guide"
1 "Secret Rules: For the *Information Guide* Only!"
1 "Skateboard Checklist"
paper and pencils*

*Provided by the teacher

SETTING UP

Suggested Time:

- Plan for 40 to 50 minutes for the activity.

Preparing for the Activity

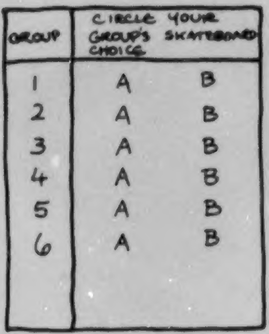
1. Read the "Rules for the Question Askers" and the "Secret Rules" cards.

2. The day before you plan to conduct the activity, select one *Information Guide* to guide each group of four students.

  - Have the *Guides* read their "Secret Rules" and "Skateboard Checklist" cards.
  - Answer any questions they might have about the rules.

3. Set out the materials for each team in separate work areas of the room.

4. Copy the illustrated chart onto the chalkboard.



GROUP	CIRCLE YOUR GROUP'S SKATEBOARD CHOICE	
1	A	B
2	A	B
3	A	B
4	A	B
5	A	B
6	A	B

THE ACTIVITY

Introducing the Activity

1. Initiate a discussion by asking the students:

  - What have you bought recently?
  - How did you know which model to buy?
  - What things did you consider before you made your choice?

2. Tell the students that they will work in small groups to decide which of two different skateboards they should buy for freestyle riding.

  - Model A costs $5.00 more than Model B.
  - In order to find out more information about these two models, they must ask questions about the skateboards.
  - At the same time, they will be assembling a puzzle of each model from puzzle pieces they earn by asking questions.

3. Tell the students that the answers to certain types of questions will give them more valuable information than will the answers to other questions.

  - These "better" questions will also "pay off" in more puzzle pieces.

4. Tell the students that their challenge is to ask those types of questions that will enable them to piece together both the puzzle and the pieces of information necessary to make an informed decision on the best skateboard to purchase. The more puzzle pieces a team earns, the more valuable information they are obtaining.

RULES FOR THE QUESTION ASKERS

THE ROLE OF THE *INFORMATION GUIDE*

The *Information Guide:*
- answers the questions the pairs of students ask about each model, and
- gives out the appropriate puzzle pieces.

Note to the *Information Guide:* Reread the rules to the students only if they have questions.

SAFETY?
SIZE?
COST?
?

THE ROLE OF THE QUESTION ASKERS

1. You are working in small groups to decide, as a group, which of two skateboard models you should buy: Model A or Model B.
- Model A costs $5.00 more than Model B.

2. To make your group decision:
- One pair of students in your group will ask questions about Model A.
- The other pair will ask questions about Model B.

3. Each pair of students is allowed ten questions.
- Partners should plan the questions they want to ask.
- The two pairs will take turns, asking one question at a time, until each pair has asked ten questions.
- Use the paper and pencil provided to write down the questions you ask and the number of puzzle pieces you receive.

4. Besides trying to gather information to decide which model to buy, you are trying to get enough puzzle pieces to assemble a puzzle of either Model A or Model B.
- Puzzle pieces are awarded according to the type of questions you ask.
- Some questions will earn more puzzle pieces than others; some questions will not earn any pieces.
- Your group must find out which types of questions earn the most puzzle pieces.

5. You can ask about only one part at a time. For example, if you ask "What materials is Model A made of?", your guide will ask you if you mean the board, the wheels, or the trucks.

6. Questions cannot have YES or NO answers. For example, you cannot ask: "Does the model come in yellow?" You should ask: "What color is Model B?" If you ask a YES or NO question, the Guide will ask you to rephrase your question.

7. If you ask a question for which the "Skateboard Checklist" has no answer, your Guide will tell you to ask another question. (That unanswerable questions does not count as one of the ten.)

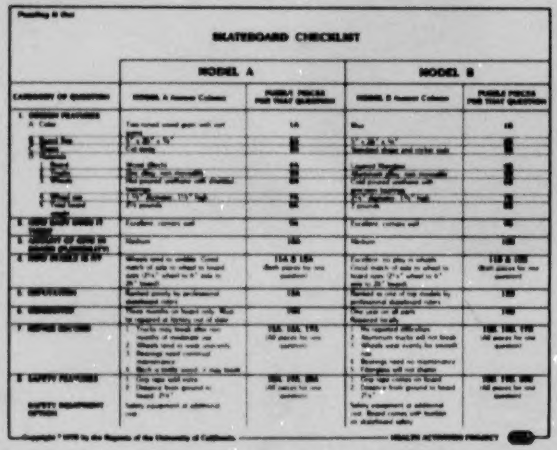
8. Even if your puzzle is not completed at the end of your ten questions, you will have to make your group decision on which model to buy.

SECRET RULES: FOR THE *INFORMATION GUIDE* ONLY!

DO NOT READ THIS CARD TO THE GROUP!

1. Empty the packets marked Model A and Model B.
   - Each packet contains 20 pieces.
   - Lay out the puzzle pieces in front of you with the numbered answer sides up.
   - Keep all the A pieces in order, and all the B pieces in order.
   - When you give out the pieces, have the students turn them over so that they can put the puzzle together.

2. Look at the "Skateboard Checklist."



   - The checklist is divided into eight categories.
   - When a student asks a question, find the appropriate category in the lefthand column.
   - Next to each category there is an answer column for both Model A and Model B.
   - Read the answer to the students, making sure you read the answer in the appropriate column (i.e. Model A answers for the A pair, B answers for the B pair).
   - Read all of the answers in each box. (When more than one puzzle piece is awarded, you will be reading all of the statements for that category.)

3. Awarding Puzzle Pieces
   - To the right of each answer column, you will find the numbered puzzle piece to award for each question or category.
   - Questions that fall under categories 1, 2, and 3 are awarded one puzzle piece each. The piece to award is listed to the right of each answer (in the Puzzle Pieces column).
   - The students may earn several puzzle pieces for any question asked in categories 4, 7, or 8. All the pieces for each category are awarded for any one question from that category.
   - Once the puzzle pieces have been given out for a category, questions in that category still count as questions, but no puzzle pieces are awarded.
   - Make sure you give pieces for Model A to the pair of students asking about Model A and those for Model B to the pair working on Model B.

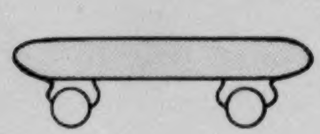
4. Begin the questioning. Make sure each pair of students knows which model they are to ask about.

5. After each pair has asked ten questions, give the group time to decide which model to buy.
   - Mark their choice on the board.

SKATEBOARD QUALITY GUIDE

There are three important parts of a skateboard to consider: the board, the wheels, and the trucks (the frames that join the wheels to the board).

BOARDS



Materials

Boards are made out of a variety of materials, including plastic, wood, fiberglass, and combinations of these materials.

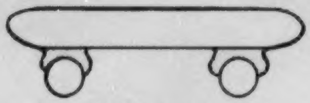
- ***Wood.*** Some types of wood, like ash and birch, are brittle and tend to break. Other types, like red or white oak, are very popular and sturdy.
- ***Fiberglass*** skateboards are generally shatterproof on impact, flexible, and long lasting.
- ***Plastic*** boards are generally not recommended because trucks cannot be securely mounted onto the boards.

Shapes

Different styles of riding require different shapes of boards.

- ***Freestyle*** skateboards are for tricks. They might be flat or rocker style, with or without a kicktail. They are generally lightweight with medium flexibility.
- ***Downhill*** skateboards are long, heavy boards that have no flexibility.
- ***Slalom*** skateboards are light with a lot of flexibility. They have cut-away board designs with no kicktail or nose.

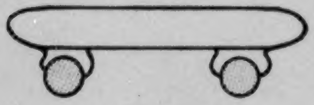
TRUCKS



Trucks are made from alloys of zinc or aluminum.

- ***Zinc*** trucks are not long lasting and break easily.
- ***Aluminum*** alloy trucks are very durable.
- Some trucks are moveable on the board, others are not.

WHEELS



Types of Wheels

Wheels are made from urethane by two methods: hot pouring and cold pouring.

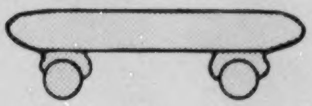
- ***Hot-poured*** wheels do not wear evenly. They tend to pick up rocks and get dented.
- ***Cold-poured*** wheels resist rocks and wear smoothly.
- Wheels should not wobble. By holding one wheel and trying to move it from side to side, you can check its stability.

Wheel Bearings

The bearings inside the wheels are of two kinds: shielded and precision.

- ***Precision*** bearings need no maintenance.
- ***Shielded*** bearings need continual cleaning and lubrication. They also tend to wobble.

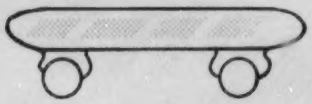
PROPORTIONS



The proportions of board parts contribute to the performance of the board. Any of the three combinations of part measurements that follow are considered to be good proportions:

- 2¼″ wheels, 5″ axle, 24″ to 26″ board.
- 2¼″ wheels, 6″ axle, 26″ board.
- 2¼″ wheels, 7″ axle, 27″ board.

SAFETY



- Grip tape on the surface of the board keeps your feet from slipping.
- Riders should wear safety equipment: a helmet, elbow and knee pads, and gloves.
- Skateboards should only be ridden in designated areas where cars are forbidden.

SKATEBOARD CHECKLIST

	MODEL A		MODEL B	
CATEGORY OF QUESTION	**MODEL A Answer Column**	**PUZZLE PIECES FOR THAT QUESTION**	**MODEL B Answer Column**	**PUZZLE PIECES FOR THAT QUESTION**
1. DESIGN FEATURES				
A. Color	Two-toned wood grain with surf scene	**1A**	Blue	**1B**
B. Board Size	5" x 26" x ¾"	**2A**	5" x 26" x ¾"	**2B**
C. Shape	Cut-away	**3A**	Standard shape and rocker style	**3B**
D. Materials				
1 Board	Wood (Birch)	**4A**	Layered fiberglass	**4B**
2 Trucks	Zinc alloy, non-moveable	**5A**	Aluminum alloy, non-moveable	**5B**
3 Wheels	Hot-poured urethane with shielded bearings	**6A**	Cold-poured urethane with precision bearings	**6B**
4 Wheel size	1-⅓" diameter, 1½" high	**7A**	2¼" diameter, 1¾" high	**7B**
5 Total board weight	2½ pounds	**8A**	2 pounds	**8B**
2. HOW EASY DOES IT TURN?	Excellent, corners well	**9A**	Excellent, corners well	**9B**
3. AMOUNT OF GIVE IN BOARD (FLEXIBILITY)	Medium	**10A**	Medium	**10B**
4. HOW STABLE IS IT?	Wheels tend to wobble. Good match of axle to wheel to board sizes (2¼" wheel to 6" axle to 26" board)	**11A & 12A** (Both pieces for one question)	Excellent, no play in wheels. Good match of axle to wheel to board sizes (2¼" wheel to 6" axle to 26" board)	**11B & 12B** (Both pieces for one question)
5. REPUTATION	Ranked poorly by professional skateboard riders	**13A**	Ranked as one of top models by professional skateboard riders	**13B**
6. GUARANTEE	Three months on board only. Must be repaired at factory out of state	**14A**	One year on all parts. Repaired locally	**14B**
7. REPAIR RECORD	1 Trucks may break after two months of moderate use 2 Wheels tend to wear unevenly 3 Bearings need continual maintenance 4 Birch is brittle wood; it may break	**15A, 16A, 17A** (All pieces for one question)	1 No reported difficulties 2 Aluminum trucks will not break 3 Wheels wear evenly for smooth ride 4 Bearings need no maintenance 5 Fiberglass will not shatter	**15B, 16B, 17B** (All pieces for one question)
8. SAFETY FEATURES	1 Grip tape sold extra 2 Distance from ground to board: 2¼"	**18A, 19A, 20A** (All pieces for one question)	1 Grip tape comes on board 2 Distance from ground to board 2¼"	**18B, 19B, 20B** (All pieces for one question)
SAFETY EQUIPMENT OPTION	Safety equipment at additional cost		Safety equipment at additional cost. Board comes with booklet on skateboard safety.	

Playing the Game

1. Tell the students that people often consult an information source like *Consumer Reports* or a knowledgeable person to find out more information about a product before buying it. Tell them that their information source will be the "Skateboard Quality Guide."

- Read it to the class.

2. Divide the class into groups of four, and assign an *Information Guide* to each group.

- If possible, include both boys and girls in each group.
- Give each group a number.
- Divide each group of four into two pairs.
- Assign each group to one of the designated work areas.

3. Appoint one pair of students in each group to ask questions about Model A and the other pair to inquire about Model B.
Tell the students that:

- The *Information Guide* answers their questions and gives them puzzle pieces. (The puzzle pieces have the appropriate answers on the back.)
- Each pair of students is allowed a total of ten questions.
- The students should write down each question they ask and the number of puzzle pieces they receive for that question.

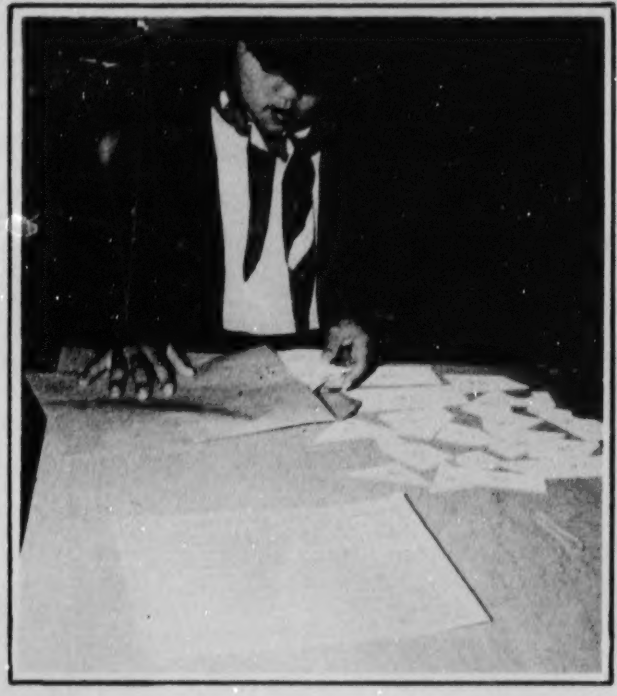
4. Read the "Rules for the Question Askers" to the class.

5. If the students have questions about the procedure, the *Information Guide* for their group can reread the "Rules for Question Askers" and/or the "Skateboard Quality Guide" to them.

- Give the *Guides* a few minutes to review the "Secret Rules."
- Each *Guide* should then set out the puzzle pieces with the numbered answer sides showing.

6. Solving the Puzzle. When the *Guides* are ready, let the question asking begin.

- Circulate among the groups and answer questions as necessary.
- After all the groups have made their decisions on which skateboard to buy, ask each group to circle their choice on the chart.



Analyzing the Data. Encourage each of the groups to discuss their choice. You might ask the students some of the following questions.

1. Which model did most groups choose?

2. What factors influenced your decisions the most?

3. Which kind of questions were awarded the most puzzle pieces?

4. Which model was the safest? (The students may need to break into groups again to find out this information.)

5. What safety recommendations are important for skateboard riders?

6. What other products have safety features that you should consider before buying the product? (Bikes, cars, boats, life rafts.)

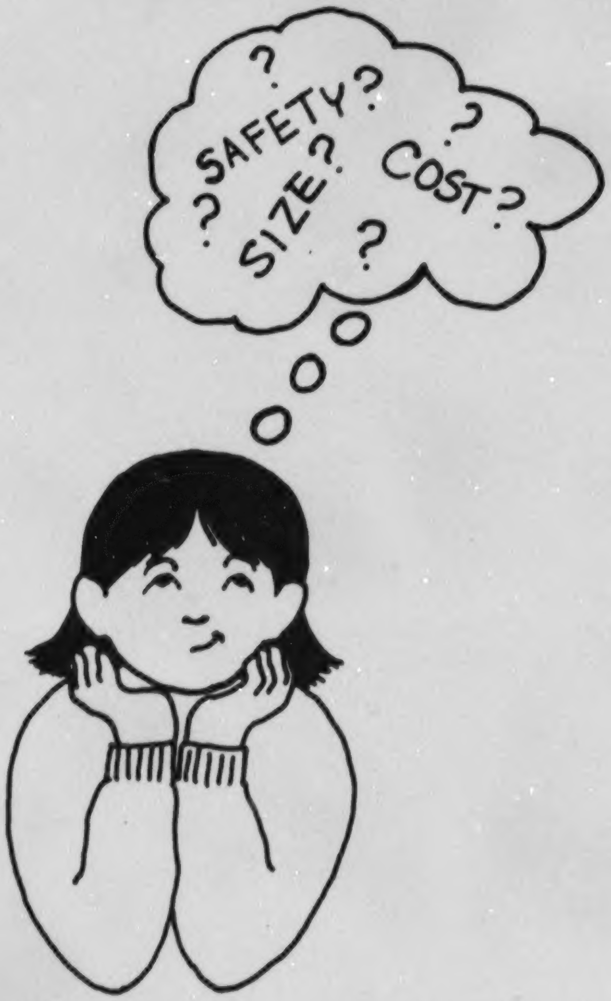
HEALTH APPLICATIONS

Your grandmother tells you to pick out a new bicycle for your birthday. She wants you to compare several models.

- What information should you find out?
- Where could you get the information?

HAP SIDETRIP

Have a group of students develop a puzzle and checklist for another product.



Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

HAP III
Trial Edition

Supported by a grant
from the Robert Wood Johnson
Foundation to the Association of
Science-Technology Centers.

LUNCH TIME

OVERVIEW

The students select lunch from a menu and then assess the nutrients in the foods they have chosen.

HEALTH BACKGROUND

Nutrition is a subject of active research, and scientists continually revise dietary recommendations in light of new studies. Most nutrition experts agree, however, that eating a variety of foods from the four basic food groups is a sound practice.

In this activity, the students select a lunch on the basis of taste appeal, and then find out how close the lunch comes to supplying one-third of the Recommended Daily Allowance (RDA) of energy, protein, and the four nutrients (calcium, iron, vitamin A, and vitamin C) that are often deficient in teenagers' diets. While not implying that lunch should supply one-third of each day's nutrient requirements, we have selected that value to represent a typical meal so that the students might learn how to plan a balanced diet.

MATERIALS

For each student:
1 *Food Values* folio
Student Sheets LT 1, LT 2, and LT 3*

For each group of four:
8 pencils, each a different color

For the class:
2 pieces of chalk*, each a different color
15 to 20 extra copies of Student Sheet LT 2*
duplicator masters of Student Sheets LT 1, LT 2, and LT 3

For "HAP Sidetrips":
1 "Finding Food Values for New Foods" Technique Card
1 Composition of Foods table* (See the Technique Card.)
1 duplicator master of Student Sheet LT 4
*Provided by the teacher.

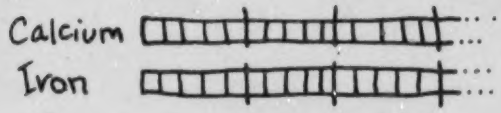
SETTING UP

Suggested Time:

- Plan for 45 to 55 minutes for Part One.
- Plan for 30 to 45 minutes for Part Two.

Preparing for the Activity

1. Draw the illustrated bar graph on the chalkboard for use in Part One.



2. Duplicate Student Sheets 1, 2, and 3.

3. For the "HAP Sidetrips." Make a copy of Student Sheet 4 for each student, and obtain a Composition of Foods table. (The Technique Card tells you where to order a food composition table. See Student Sheet 4 for the other materials the students will need.)

THE ACTIVITY: PART ONE

Introducing the Activity

1. Ask questions that will start the students thinking about *their* roles in choosing the foods they eat.

- How often do you plan your own lunch?
- What are some of your favorite lunch foods?
- Do you think your favorite lunch foods are good for you?

2. Tell the students that they will investigate the nutritional value of their favorite foods.

Planning Three Lunches

1. Distribute copies of Student Sheet 1.

2. Ask the students to circle *every* food item on the menu that they like, regardless of whether parents or others might approve.

3. Now ask the students to make up three different lunches from the circled foods and to write each lunch selection in one of the Lunch Boxes on Student Sheet 1. Tell the students:

- You don't have to include *all* your circled foods in your lunches.
- Choose your lunches on the basis of what *you like to eat.*
- Each lunch should include the same *amount* of food that you usually have.
- Select foods from the kitchen, vending machines, refreshment stand, or any combination of these three.
- List the individual ingredients of sandwiches and other items that are combinations of foods.
- Feel free to include two or more servings of a particular food item in any lunch, or to include the same foods in more than one lunch.

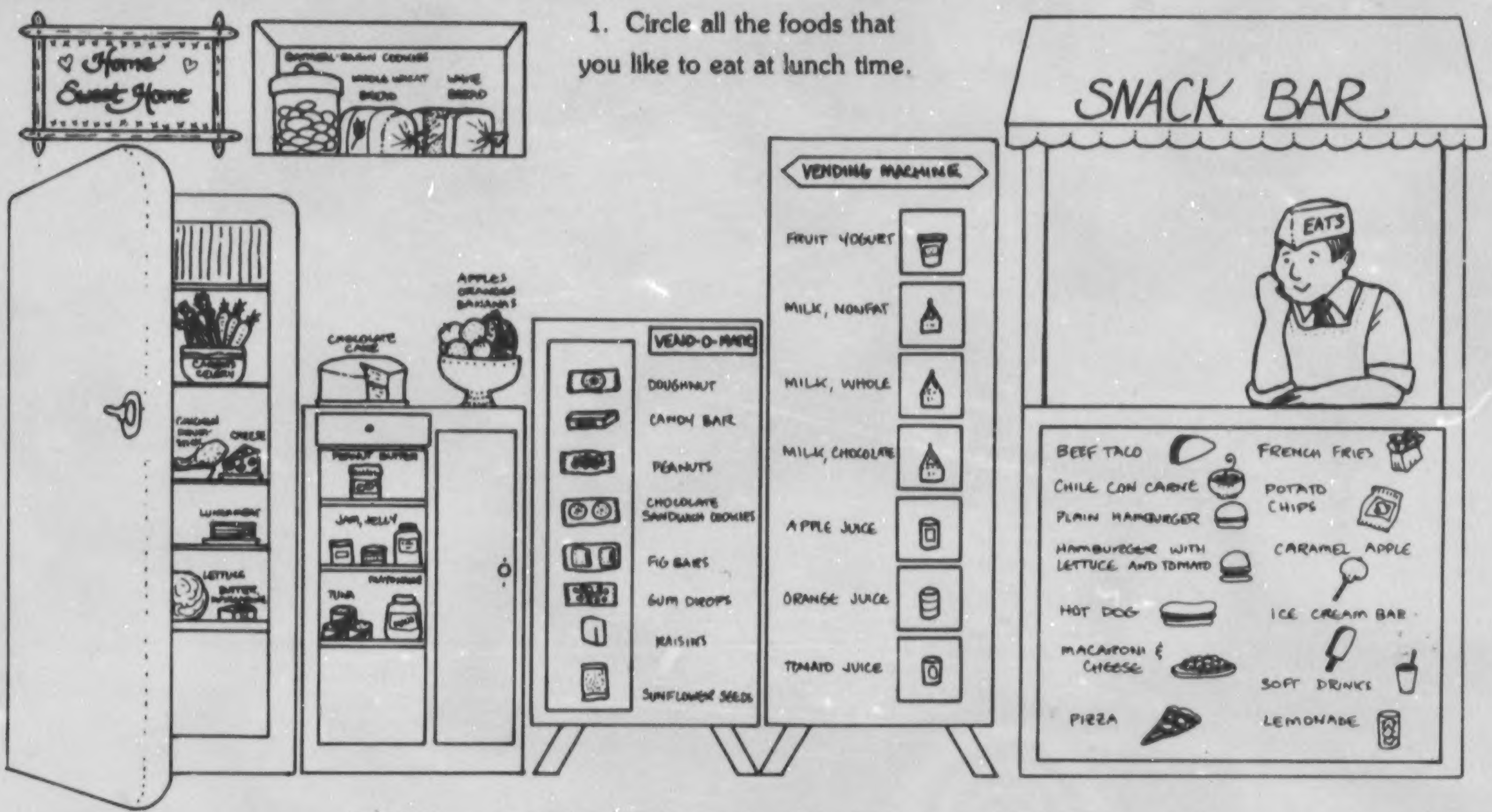
4. Before having the students begin, write a sample lunch selection on the chalkboard, e.g. a tuna sandwich (two slices of white bread, tuna, and mayonnaise), two carrots, fig bars, and a soft drink.

5. Allow the student ten minutes to:

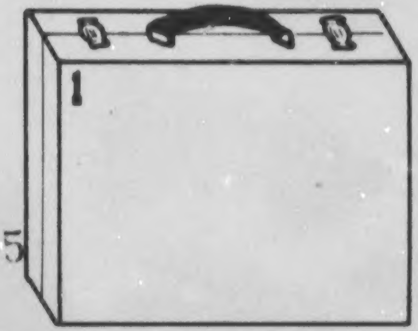
- write each lunch menu in one of the boxes, and
- select and circle one lunch for closer examination.

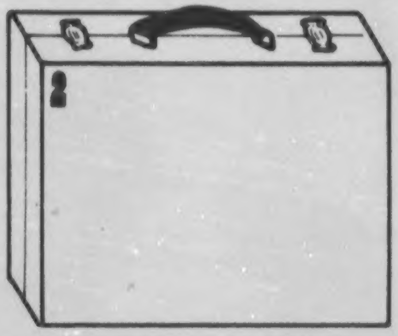
Name______________________________

1. Circle all the foods that you like to eat at lunch time.


Home Sweet Home
OATMEAL-RAISIN COOKIES
WHOLE WHEAT BREAD
WHITE BREAD
CARROTS CELERY
CHICKEN DRUMSTICK
CHEESE
LUNCHMEAT
LETTUCE
BUTTER, MARGARINE
CHOCOLATE CAKE
APPLES ORANGES BANANAS
PEANUT BUTTER
JAM, JELLY
TUNA
MAYONNAISE
VEND-O-MATIC
DOUGHNUT
CANDY BAR
PEANUTS
CHOCOLATE SANDWICH COOKIES
FIG BARS
GUM DROPS
RAISINS
SUNFLOWER SEEDS
VENDING MACHINE
FRUIT YOGURT
MILK, NONFAT
MILK, WHOLE
MILK, CHOCOLATE
APPLE JUICE
ORANGE JUICE
TOMATO JUICE
SNACK BAR
EATS
BEEF TACO
CHILE CON CARNE
PLAIN HAMBURGER
HAMBURGER WITH LETTUCE AND TOMATO
HOT DOG
MACARONI & CHEESE
PIZZA
FRENCH FRIES
POTATO CHIPS
CARAMEL APPLE
ICE CREAM BAR
SOFT DRINKS
LEMONADE

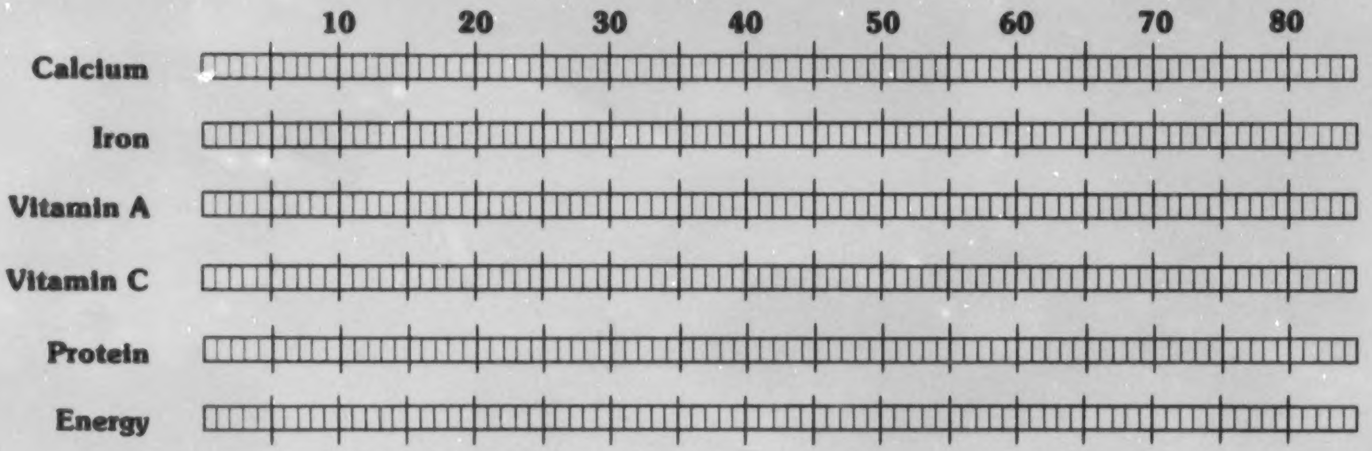
2. Make up three lunches from any of the foods you circled above.





Name________________________

ADDING UP THE NUTRIENTS IN MY LUNCH



COLOR KEY

Color code for the foods in my lunch:

Color = Food

○ =
○ =
○ =
○ =
○ =
○ =
○ =

RECOMMENDATIONS FOR MY LUNCH

(Answer these questions after you have used Student Sheet 3.)

1. The amount of energy in my lunch is (circle one):
   too low   about right   too high
2. Nutrients I need more of are: ____________________
   ____
3. Foods that could provide these nutrients are: ____________________
   ____
4. Foods I chose that have a lot of energy (calories) but not many other nutrients are: ____________________

Name______________________

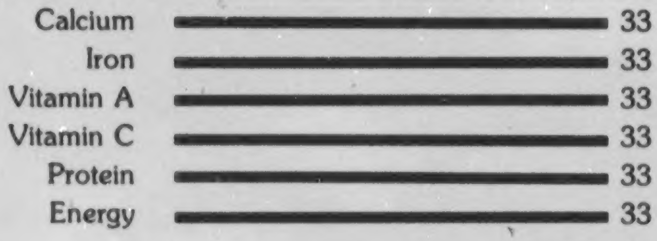
Student Sheet LT 3

WHAT IS A GOOD LUNCH SCORE?

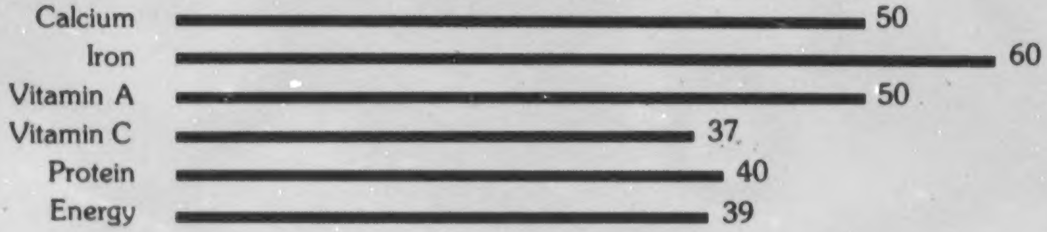
1. Find the bar graph for your age and sex.
2. The numbers at the end of each bar in the graph represent one-third of your Recommended Daily Allowance (RDA) for that nutrient.
3. On each nutrient bar on Student Sheet 2, count off the number of squares indicated on each bar on your graph below. Draw a half-inch vertical line at that point across the bar.

RECOMMENDED DAILY ALLOWANCES FOR DIFFERENT AGE GROUPS

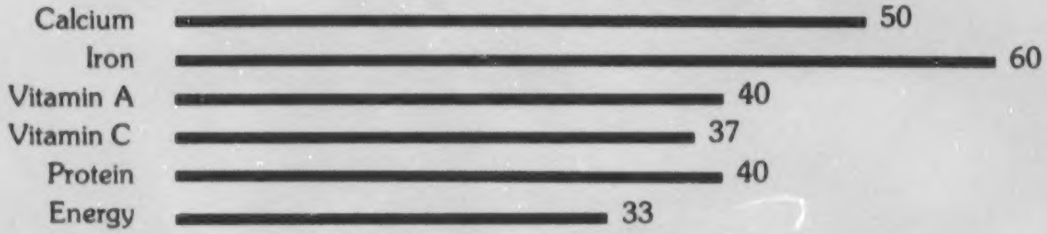
Nine- to Ten-year-old Girls and Boys



Eleven- to Fourteen-year-old Boys



Eleven- to Fourteen-year-old Girls



Name______________________________

Student Sheet LT 4

PLAYING *LUNCH TIME* WITH YOUR FAMILY

MATERIALS

For each person:
Student Sheet 1
Student Sheet 2

For the family:
1 *Food Values* folio
colored pencils

1. Circle all the foods you like on Student Sheet 1, "Menu." Then plan three different lunches, and write them in the Lunch Boxes on Student Sheet 1.
2. Pick one lunch to score. Circle it.
3. Find *each* of the foods in your circled lunch in *Food Values*. Read the number by each nutrient bar and color that number of squares in the appropriate bar on Student Sheet 2.
4. Use a different color for each food.
5. The chart below tells you how many squares it takes to meet one-third of your Recommended Daily Allowance. Find the RDA of each nutrient for your sex and age, and mark each bar on Student Sheet 2 at that point. Then answer questions 1 through 4 on Student Sheet 2.

		NUMBER OF SQUARES EQUAL TO ONE-THIRD RDA					
AGE	**SEX**	Calcium	Iron	Vitamin A	Vitamin C	Protein	Energy
7 to 10	Both	33	33	33	33	33	33
11 to 14	Male	50	60	50	38	41	39
	Female	50	60	40	38	41	33
15 to 18	Male	50	60	50	38	50	42
	Female	50	60	40	38	44	29
19 to 22	Male	33	33	50	38	50	42
	Female	33	60	40	38	43	29
23 to 50	Male	33	33	50	38	52	38
	Female	33	60	40	38	43	28
51+	Male	33	33	50	38	52	33
	Female	33	33	40	38	43	25

Lunch Time
Technique Card

FINDING FOOD VALUES FOR NEW FOODS

1. Obtain a Composition of Foods table that lists the amounts of calcium, iron, vitamin A, vitamin C (also called ascorbic acid), protein, and calories *per serving* of various foods. One such resource is *Nutritive Value of American Foods in Common Units* by Catherine F. Adams, U.S. Department of Agriculture, 1975. It is available for $5.15 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

2. To find the number of *Lunch Time* squares in a new food:
- Find the food in the table.
- Copy the amounts of the six nutrients found in that food. (For convenience, you might duplicate the worksheet below and record the amounts on it.)
- Divide the amount of each nutrient by the appropriate conversion factor given on the worksheet.

WORKSHEET

Name of Food ______________________ Serving Size ______________________

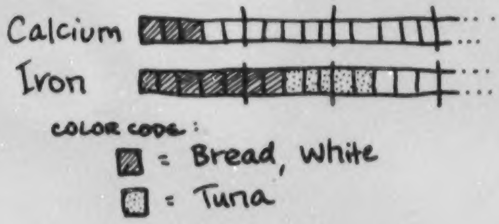
VALUE FROM TABLE	÷	CONVERSION FACTOR	=	NUMBER OF SQUARES
Calcium: ______ grams	÷	36	=	______ squares of calcium
Iron: ______ milligrams	÷	8	=	______ squares of iron
Vitamin A: ______ international units	÷	33	=	______ squares of Vitamin A
Vitamin C: ______ milligrams	÷	0.4	=	______ squares of Vitamin C
Protein: ______ grams	÷	36	=	______ squares of protein
Energy: ______ calories	÷	24	=	______ squares of energy

Introducing Food Values. Tell the students that now they are going to find the total amount of certain nutrients in their chosen lunches.

1. Distribute copies of Student Sheet 2 and the *Food Values* folios.

2. Read aloud from Student Sheet 2 the six nutrients to be plotted.

3. Using the bar graph on the chalkboard, show the students how to plot the amounts of calcium and iron in two of the foods (e.g. bread and tuna) from your sample lunch. Use a different color chalk for each food. As you work, give the students the following instructions:



- Select a different colored pencil to represent each *food*.
- Record your color code in the Color Key on Student Sheet 2.
- Find the food in the *Food Values* folio.
- The number at the end of each bar is the number of units of that nutrient in the food item. (Each unit is represented by a square on the bar graph on Student Sheet 2.)
- Color the appropriate number of squares for the amounts of all six nutrients in *each* food item in your lunch.

4. Ask the students to look up "carrots" in *Food Values*. Tell them:

- Notice that carrots are listed at 50 + units of vitamin A. Because any number of units over 50 would not fit on the page, food items containing more than 50 units are labeled **50 +**. On your Student Sheets, color 50 squares for such items and write a "+" above the last square.

Combining Food Values

1. Divide the class into groups of four, and give each group a set of colored pencils.

2. Give the students time to total the nutrients in one lunch.

3. Provide additional copies of Student Sheet 2 for students who run out of empty squares for any nutrients.

THE ACTIVITY: PART TWO

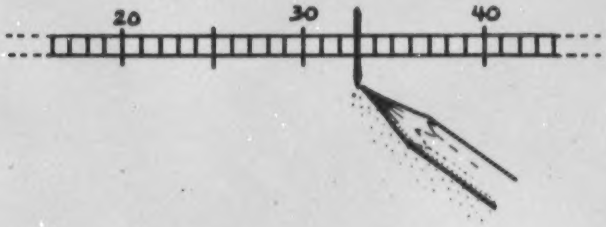
Introducing Part Two

1. Distribute copies of Student Sheet 3.

2. Ask the students to find the correct bar graph for their age and sex.

3. Explain that the numbers at the end of each bar represent one-third of the Recommended Daily Allowance of the nutrient. One-third of the RDA is considered the "ideal" lunch score in this activity.

4. Show the students how to draw a half-inch vertical line across each bar on Student Sheet 2 at the "ideal" score for each nutrient.



5. Before they begin, ask the students:

- What does a bar that is *not* colored up to the vertical line mean?
- What does a bar that is colored *beyond* the vertical line mean?

Scoring a Lunch

1. Ask the students to draw their vertical lines.

2. Instruct the students to answer questions 1 and 2 on Student Sheet 2.

- Tell the students to consider a bar within five squares of the one-third RDA mark to be about right.

Analyzing the Data

1. Tally the students' lunch scores.

- Complete a chart similar to the one illustrated.

	TOO LOW	ABOUT RIGHT	TOO HIGH
CALCIUM	|||		
IRON	𝍸 |||		
VITAMIN A	𝍸 ||		
VITAMIN C	|||		
PROTEIN	||		
ENERGY	||||	𝍸 𝍸	𝍸 |||

2. Ask the students:

- What do the results show about the lunch foods the class likes?
- What happens to people who always take in more energy (calories) than they burn up?

3. Explain that taking in more than the RDA for the four nutrients and protein is neither an advantage nor a disadvantage.

- Too many calories, however, may cause a weight gain.
- Also, it *is* possible to take harmfully high amounts of some vitamins by taking more vitamin pills than recommended.

4. Ask the students how they could find out if the lunch score they received is a typical one for them.

5. Challenge the students to improve their lunch scores.

- Instruct the students to use the *Food Values* folios to answer questions 3 and 4 on Student Sheet 2.
- Ask the students to share their ideas on improving their lunch scores.

6. Ask the students:

- What foods surprised you by containing more nutrients than you expected?
- Less nutrients?

HEALTH APPLICATIONS

1. What do you think people mean by "junk food"? "Health food"?

2. We scored foods on calcium, iron, vitamin A, vitamin C, protein, and energy. What else should you consider when deciding if the food you eat is good for you?

HAP SIDETRIPS

1. Encourage the students to teach their families how to play *Lunch Time*. Let them take home Student Sheet 4 and the materials listed on it.

2. Record and evaluate actual lunches. (Use the "Finding Food Values for New Foods" Technique Card and a Composition of Foods table to help students whose lunches include foods not listed in *Food Values*.)

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FOOD VALUES

This folio must be used with the *Lunch Time* activity.

APPLE

calcium	1
iron	4
vitamin A	4
vitamin C	10
protein	1
energy	3

APPLE JUICE, 5½-ounce can

calcium	1
iron	10
vitamin A	0
vitamin C	5
protein	1
energy	3

BANANA

calcium	1
iron	8
vitamin A	7
vitamin C	30
protein	4
energy	4

BEEF TACO

calcium	36
iron	28
vitamin A	20
vitamin C	15
protein	50+
energy	14

BREAD, WHITE, 1 slice

calcium	3
iron	7
vitamin A	0
vitamin C	0
protein	7
energy	3

BREAD, WHOLE WHEAT, 1 slice

calcium	3
iron	8
vitamin A	0
vitamin C	0
protein	7
energy	3

BUTTER OR MARGARINE, 1 pat

calcium	0
iron	0
vitamin A	5
vitamin C	0
protein	0
energy	2

CANDY BAR, 1½ ounces

calcium	10
iron	6
vitamin A	0
vitamin C	0
protein	10
energy	8

CARAMEL APPLE

calcium	9
iron	10
vitamin A	4
vitamin C	10
protein	5
energy	11

CARROT

calcium	3
iron	5
vitamin A	50+
vitamin C	15
protein	2
energy	1

CELERY, 1 stalk

calcium	2
iron	1
vitamin A	3
vitamin C	10
protein	1
energy	0

CHEESE SLICES, 1 3/5 ounces

calcium	42
iron	5
vitamin A	18
vitamin C	0
protein	31
energy	7

CHICKEN DRUMSTICK

calcium	1
iron	9
vitamin A	2
vitamin C	0
protein	34
energy	4

CHILE CON CARNE, 1 cup

calcium	10
iron	43
vitamin A	5
vitamin C	0
protein	50+
energy	14

CHOCOLATE CAKE, 1 slice

calcium	9
iron	10
vitamin A	5
vitamin C	0
protein	12
energy	15

CHOCOLATE MILK, 1 cup

calcium	35
iron	5
vitamin A	10
vitamin C	8
protein	24
energy	9

CHOCOLATE SANDWICH COOKIES, 4 cookies

calcium	1
iron	3
vitamin A	0
vitamin C	0
protein	5
energy	8

DOUGHNUT

calcium	2
iron	6
vitamin A	1
vitamin C	0
protein	8
energy	7

FIG BARS, 4 bars

calcium	6
iron	6
vitamin A	2
vitamin C	0
protein	6
energy	8

FRENCH FRIES, 3 ounces

calcium	2
iron	11
vitamin A	0
vitamin C	45
protein	10
energy	10

FRUIT YOGURT, 8-ounce carton

calcium	35
iron	5
vitamin A	5
vitamin C	5
protein	22
energy	9

GUMDROPS, 1½ ounces

calcium	0
iron	2
vitamin A	0
vitamin C	0
protein	0
energy	6

HAMBURGER, PLAIN

calcium	5
iron	29
vitamin A	1
vitamin C	0
protein	50+
energy	13

HAMBURGER WITH LETTUCE AND TOMATO

calcium	6
iron	31
vitamin A	9
vitamin C	16
protein	50+
energy	13

HOT DOG

calcium	4
iron	17
vitamin A	0
vitamin C	0
protein	25
energy	11

ICE CREAM BAR

calcium	16
iron	3
vitamin A	8
vitamin C	2
protein	11
energy	9

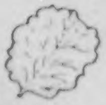
JAM OR JELLY, 1 Tablespoon

calcium	1
iron	2
vitamin A	0
vitamin C	2
protein	1
energy	2

LEMONADE, 1 cup

calcium	0
iron	1
vitamin A	0
vitamin C	42
protein	1
energy	4

LETTUCE, 1 leaf

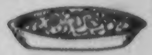


calcium	1
iron	1
vitamin A	2
vitamin C	2
protein	1
energy	0

LUNCHMEAT, 1 one-ounce slice

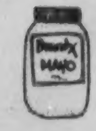
calcium	0
iron	4
vitamin A	0
vitamin C	0
protein	8
energy	2

MACARONI AND CHEESE, 1 cup



calcium	45
iron	18
vitamin A	26
vitamin C	0
protein	47
energy	18

MAYONNAISE, 1 Tablespoon



calcium	0
iron	1
vitamin A	1
vitamin C	0
protein	1
energy	4

MILK, NONFAT FORTIFIED, 1 cup

calcium	45
iron	1
vitamin A	30
vitamin C	5
protein	27
energy	4

MILK, WHOLE, 1 cup

calcium	36
iron	1
vitamin A	11
vitamin C	5
protein	24
energy	7

OATMEAL RAISIN COOKIES, 4 cookies

calcium	1
iron	15
vitamin A	1
vitamin C	0
protein	9
energy	10

ORANGE

calcium	7
iron	5
vitamin A	8
vitamin C	50 +
protein	4
energy	3

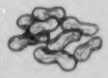
ORANGE JUICE, 6-ounce can

calcium	2
iron	7
vitamin A	11
vitamin C	50+
protein	4
energy	4

PEANUT BUTTER, 2 Tablespoons

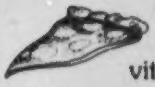
calcium	2
iron	6
vitamin A	0
vitamin C	0
protein	22
energy	8

PEANUTS, 1½ ounces



calcium	4
iron	9
vitamin A	0
vitamin C	0
protein	31
energy	10

PIZZA, 1 slice



calcium	18
iron	7
vitamin A	12
vitamin C	12
protein	22
energy	6

POTATO CHIPS, 1¼ ounces

calcium	2
iron	6
vitamin A	0
vitamin C	16
protein	5
energy	8

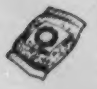
RAISINS, 1½ ounces

calcium	3
iron	15
vitamin A	0
vitamin C	0
protein	3
energy	5

SOFT DRINK, 12-ounce can

calcium	0
iron	0
vitamin A	0
vitamin C	0
protein	0
energy	7

SUNFLOWER SEEDS, ⅓ cup



calcium	7
iron	33
vitamin A	1
vitamin C	0
protein	31
energy	11

TOMATO JUICE, 5½-ounce can

calcium	2
iron	15
vitamin A	41
vitamin C	50+
protein	4
energy	1

TUNA, ¾ ounce

calcium	0
iron	5
vitamin A	1
vitamin C	0
protein	22
energy	2

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FAT CHANCE

FAT CHANCE GAME BOARD

OVERVIEW

The students play a board game in which they must balance their food intake with their exercise level.

HEALTH BACKGROUND

A calorie is a unit of measure for the amount of energy in food. The body uses energy for reproduction, growth, maintenance, motion, resistance to disease, and repair. If, day after day, we eat foods that have fewer calories than we use, we lose weight. If we eat foods that have more calories than we use, we store the extra energy as fat and we gain weight. Both too much weight and not enough weight are factors that contribute to stress on the body.

Our eating habits affect our weight and health. Many people skip breakfast entirely or have only a cup of coffee or juice. For others, lunch is often just a quick bite. These practices often increase the temptation to nibble high calorie foods between meals and to overeat at the evening meal. Not eating balanced meals can also cause serious vitamin and mineral deficiencies.

MATERIALS

For each student:
1 Student Sheet FC* (optional, for Sidetrip)

For each group of four:
1 Fat Chance Game (4 Calories/Stress racks, 4 colored markers, 1 spinner dial, plastic chips, 1 game board, and 4 decks of cards)

For the class:
1 timer
duplicator master of Student Sheet FC

*Provided by the teacher.

SETTING UP

Suggested Time:

- Plan for 40 to 60 minutes for Part One.
- Plan for 30 minutes for Part Two.

Preparing for the Activity

1. Make sure that you have enough space for all the groups to sit around their game boards.

2. For the Sidetrip. Duplicate the Student Sheet.

THE ACTIVITY: PART ONE

Introducing the Activity

1. Ask the students some questions to start them thinking about how their eating and exercising habits affect their health.

- How does the amount of food we eat and the amount of exercise we do affect our weight?
- Explain to the students that when we gain weight, our hearts are stressed because they must work harder to meet the strain of excess weight. (Weight gained due to muscular development does not significantly increase the effort of the heart.)
- What do you think would happen to your body if you lost weight too quickly? (Your body would be stressed because it wasn't receiving all the energy and nutrients it requires.)

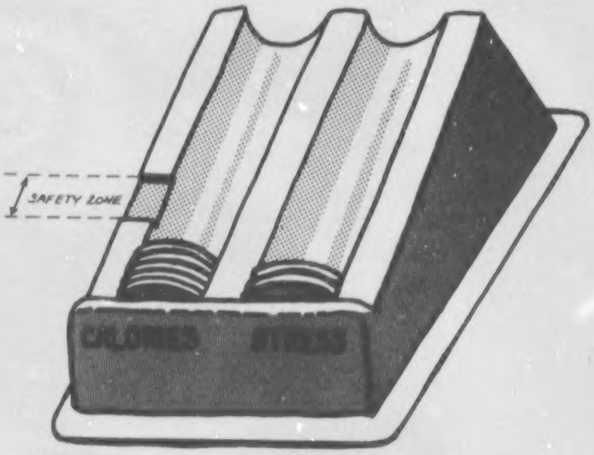
2. Tell the students that you have a board game that simulates the sometimes difficult process of reaching and maintaining a safe weight while at the same time avoiding stress. Introduce the game as a way that the students can:

- learn to control and balance their food intake and their exercise level.
- investigate how social and cultural values affect food intake.

Explaining the Pieces of Equipment. Bring out one game, and explain the functions of the equipment pieces.

1. Calories/Stress Rack and Chips

- The rack represents the player's body. During play, the participants add and take away calories, represented by chips.



- The indentation on the left side of the rack is the Safety Zone, which represents the ideal range of calories the body should take in. A stack of chips that falls above or below this range represents stress to the body.
- Each chip represents either 100 calories if it is in the Calories column, or one unit of stress if it is in the Stress column.

2. Fat Chance Spinner Dial

- The players spin the spinner to determine how far to move and how many calories to use up.

Name________________________

Student Sheet FC

CONSIDERING VITAMINS C AND K

1. Each square in the following graphs represents one unit of vitamin C or vitamin K.
2. When you select foods from food cards or Snack squares, check the number of units of each vitamin in your food item, and fill in the appropriate number of squares.
3. At the end of the game, you must have colored in all the squares in order to have an adequate amount of each vitamin in your diet.
4. If you have not filled in all the squares for both vitamins by the time you reach Home, continue adding chips to your Stress column whenever the timer rings.

VITAMIN C ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

VITAMIN K ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
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3. Fat Chance Cards

- When a player spins "Fat Chance" or lands on a Fat Chance square, she draws a Fat Chance Card.
- The player reads the card to the other players, does what the card says, and returns the card to the bottom of the deck.

4. Food Cards (Breakfast, Lunch, and Dinner)

- If a player cannot move (too few calories in Calorie column) or chooses not to spin, she selects a food card. (Her position on the board determines whether she takes a Breakfast, Lunch, or Dinner card.)
- From the card, she selects a food, "eats" it, and adds the appropriate number of calories to her rack.

Notes:

1. All per-serving calorie amounts have been rounded off to the nearest hundred for convenience. Thus, foods that have 50 calories or less have been listed as containing 0 (zero) calories.

2. The vitamin information on the cards is for the HAP Sidetrip. Tell the students to ignore this information for Games One and Two.

Explaining the Setup

1. The four decks of cards (Breakfast, Lunch, Dinner, and Fat Chance) are each shuffled separately and placed face down on the appropriate spaces on the board.

2. Each player selects a plastic marker and places it on Home.

3. All the chips are piled in the center of the game board.

4. Each player then spins the spinner, reads *only the number* on the dial, and starts the game with the following numbers of calories:

- The player with the highest number starts the game with 25 chips (2500 calories) in her Calories column.
- The player with the lowest number starts with 5 chips (500 calories).
- The remaining two players start with 15 chips each (1500 calories).
- For a tie for the highest or lowest number, the tying players spin again.
- Each player then places her chips in the Calories column of her rack.

How to Play the Game

1. The timer is set for three minutes.

2. The player with the highest number takes the first turn, and play then continues clockwise around the board.

3. At each turn, a player *spins the spinner* or *selects a food card*.

4. If she spins, she moves one space forward *for each 100 calories* indicated by the spinner and must remove one chip from her Calories column for each space she moves.

- If she spins "Your Choice," she selects the number of chips to remove (and thus the number of spaces to move forward).
- If she does not have enough calories in her Calories/Stress rack to complete the move, she must add one chip from the board to her Stress column and wait for her next turn. (She does *not* add a stress chip if she has enough calories to cover her move.)
- On her next turn, she must select a food card instead of spinning.

5. Whenever a player takes a food card instead of spinning, she does not move her marker. The player:

- selects one food item from the card, and
- adds the proper number of calorie chips to the Calories column of her rack.

6. Snack Space. Whenever a player lands on or passes a Snack space on the board, she has the choice of snacking (and adding calorie chips), or not snacking.

7. Each time the timer rings, each player checks the Calories/Stress rack. If a player's top chip in the Calories column is either above or below the indented Safety Zone, that player's "body" is under stress.

- She should add one chip from the board to her Stress column.
- The teacher then resets the timer for another three minutes, and play resumes.

8. On Reaching Home. Once a player reaches Home, she stops moving and taking food cards. Each time the timer rings, however, she must check the Calories column on her rack and add stress chips to her Stress column (if necessary) until the game ends.

9. Who wins? The game ends when everyone reaches Home. The player with the least number of stress chips wins. In case of a tie, the player who reached Home first wins the game.

Playing Game One

1. Remind the students that the object of the game is to reach and maintain a safe calorie level and to avoid stress.
   - Explain that planning ahead and figuring out ways to reach Home with fewer stresses than the other players is the way to win.
2. Divide the class into groups of four.
3. Give each group one game, and let them begin.

Analyzing the Data

1. Ask the students what they learned by playing the game.
   - If you had too few calories most of the time, what did you do to try to get back into the Safety Zone?
   - What did you do when you had too many calories?
   - When did you want high or low spins? Why?
   - What kinds of foods or snacks did you find yourself choosing? Why?
   - Why should the player with the least number of stress chips be the winner of the game?
2. Ask the students to tell about times when they have eaten although they were not really hungry.
3. Have the students make up some new Fat Chance cards to add to the deck for Part Two.

THE ACTIVITY: PART TWO

Introducting Part Two. Ask the students to suggest different strategies for winning the game.
- How would you play if you started out with a lot of calories? With only a few calories?

Playing Game Two

1. Challenge the students to play the game again with the same rules, but trying for fewer stress chips than they received in Game One.
2. Add the new Fat Chance cards to the deck.

Analyzing the Data

1. How did the strategy used in Game Two differ from that in Game One?
2. How can a person eat more than she usually does and still weigh the same? How can she eat less and still weigh the same?
3. Would you prefer to control your weight by eating less or by exercising more? Why?

HEALTH APPLICATIONS

You stay over at a friend's house and your friend's mother keeps insisting that you eat more.
- What would you do? Why?
- If you refused, how could you do it without hurting her feelings?

HAP SIDETRIP

Ask the students to play the game again, this time using the vitamin information on the food cards.
- Instruct the students to fill in the squares on their Student Sheets as they draw food cards.
- After the game, ask the students how this variation affected their strategies.

Health Activities Project
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JAWS

OVERVIEW

The students, by making and working with impressions of their teeth, investigate the shape, size, and function of teeth.

HEALTH BACKGROUND

The four kinds of human teeth each have a different shape and location, which determine their functions.

Incisors are the wide, wedge-shaped teeth in the front of the mouth. The upper and lower incisors close down on food and rip out bites.

Cuspids (or canines) are the sharp, pointed teeth next to the incisors. Each cuspid has a single point, which tears food.

Bicuspids (having two points) are behind the cuspids and crush food.

Molars are the nearly flat teeth in the back of the mouth. These teeth grind food the way millstones grind grain.

MATERIALS

PART ONE

For each student:
1 collection tray (for carrying materials)
1/5 of a one-pound clay block
1 upper mouth tray
1 lower mouth tray
2 mixing bags filled with plaster†
1 sheet of mirrored plastic
1 paper towel*
1 Student Sheet J1*

For each team of four:
1 244-ml (8 oz.) measuring cup filled with water
1 55-ml measuring vial (for measuring water and plaster)
5 meters of wide masking tape

For the class:
extra plaster
1 "Making the Impressions" Technique Card
duplicator masters of Student Sheets J1, J2, and J3

PART TWO

For each team of four:
4 sheets of mirrored plastic
1 red pencil
1 blue pencil
1 dull knife*
½ apple*
2 sticks of sugarless gum*
4 paper towels*
4 copies each of Student Sheets J2 and J3*

For the class:
1 Soaking Station (See the "Disinfecting the Equipment" Technique Card in the *What's HAPpening?* folio.)

*Provided by the teacher.
†See "Preparing for Part One."

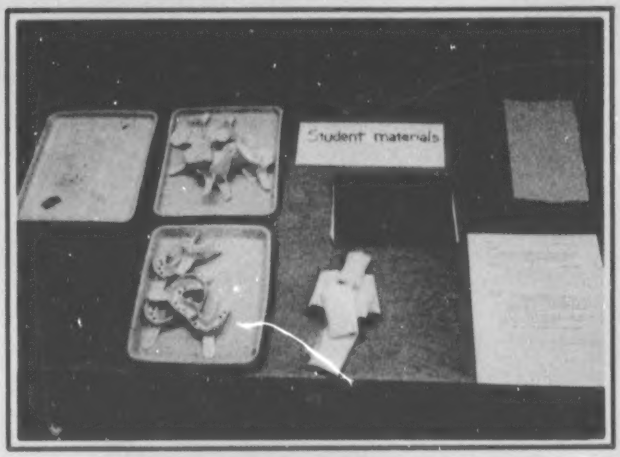
SETTING UP

Suggested Time:

- Plan for 60 to 90 minutes for Part One.
- Plan for 60 to 90 minutes for Part Two.

Preparing for Part One

1. Place the clay in a warm area to soften.
2. Prepare two bags of plaster for each student.
   - Have several students *pack* the measuring *vials* to the top with plaster and pour a packed vialful into each mixing bag.
   - Or, place one-third of the bulk plaster at each Student Station. (See #3 below.) Each student can then measure out his own plaster.
3. **Student Stations.** Set up three distribution stations with the materials listed under "Part One, For each student." List the student materials on the chalkboard for reference.



4. **Team Stations.** Set up three distribution stations with the team materials as listed under "Part One, For each team of four." List these materials on the chalkboard for reference.
5. Familiarize yourself with the procedures for making the clay molds and the plaster impressions. (See the Technique Card.)
6. Duplicate the Student Sheets.

Preparing for Part Two. Prepare for Part Two after Part One has been completed.

1. **Team Stations.** Set up three distribution stations with the materials listed under "Part Two, For each team of four," and list the materials on the chalkboard.
2. Set up one Soaking Station as described on the "Disinfecting the Equipment" Technique Card.

Name____________________________ Student Sheet J 1

FINDING OUT HOW THE NUMBER OF TEETH WE HAVE VARIES WITH AGE

ACTIVITY TO DO AT HOME

1. Take this sheet home, and count and record the number of *natural* teeth younger and older members of your family or friends have.
2. Be sure to record the ages of the people you work with.

PERSON	AGE	NUMBER OF TEETH

ACTIVITY TO DO IN CLASS

MATERIALS

For each student:
your plaster impressions
1 sheet of mirrored plastic

For the group:
1 red pencil
1 blue pencil

Look at your own teeth in the mirrored plastic.

1. Find your primary (baby) teeth.
   - Use a red pencil to indicate your baby teeth on your plaster impressions.
2. Find your permanent teeth.
   - Use a blue pencil to indicate your permanent teeth on your plaster impressions.
3. How are primary teeth different from permanent teeth?

Name________________________________ Student Sheet J 2

FINDING OUT HOW YOUR TEETH WORK

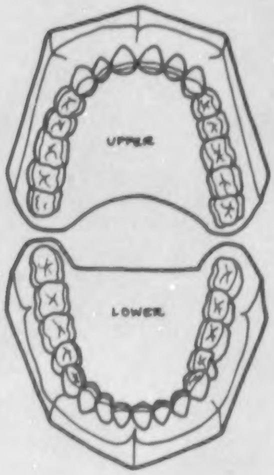
MATERIALS

For each student:
1 slice of apple
½ stick of sugarless gum
your plaster impressions
1 sheet of mirrored plastic
1 paper towel

1. **Predicting.** Draw an arrow from each function to the teeth that you *think* perform it.

a. Teeth that ***bite off*** chunks.
b. Teeth that ***crush*** food.
c. Teeth that ***tear*** food apart.
d. Teeth that ***grind*** food.

FUNCTION
BITE OFF
CRUSH
TEAR
GRIND



2. **Testing Your Predictions.** Draw an arrow from each function to the teeth that you *use* to complete each of the following tasks.

a. Bite down on a piece of apple.
   - Which teeth do you use to ***bite off*** chunks?

b. Chew the apple.
   - Which teeth do you use to ***crush*** the apple into smaller pieces?

c. Bite down on a paper towel with your front teeth. Try to pull the paper out. Compare this with how the paper tears when you bite down with your cuspids (or molars).
   - Which teeth are better at ***tearing*** the paper?

d. Chew on a piece of gum.
   - Which teeth do you use to ***grind*** the gum?

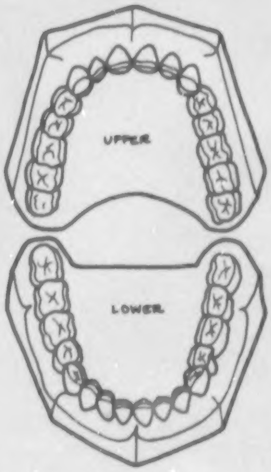
FUNCTION

BITE OFF

CRUSH

TEAR

GRIND



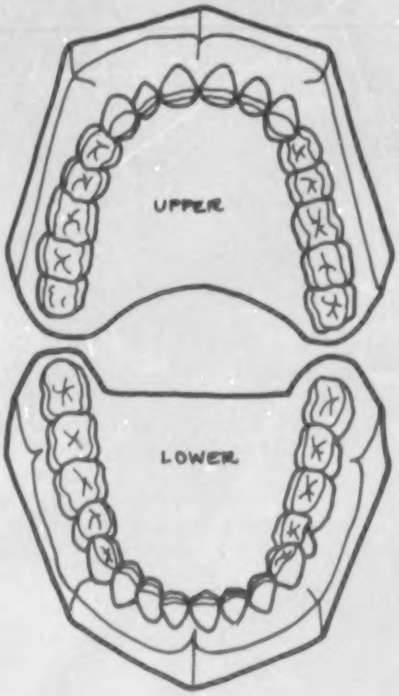
Name______________________________ Student Sheet J 3

COMPARING THE SIZE OF YOUR TEETH

MATERIALS

For each student:
your plaster impressions
1 sheet of mirrored plastic

Draw an arrow to the tooth (teeth) on the diagram that answers these questions.



1. Look at your upper teeth.
   - Which of your front four teeth (incisors) are larger than the others?
2. Look at your lower teeth.
   - Which of your front four teeth (incisors) are larger than the others?
3. Look at your upper teeth.
   - Which of your back two teeth (molars) is larger?
4. Which *one* tooth is the largest tooth in your whole mouth, including both your uppers and lowers?

In general:

1. What size differences do you see between your upper front teeth and your lower front teeth? ____
   ____
2. What size difference do you see between your upper back teeth and your lower back teeth?______
   ____
3. Why do you think there is a difference? ______________________________
   ____

Jaws
Technique Card

MAKING THE IMPRESSIONS

Note: Wash your hands before working with clay and plaster. Be sure to work with the clay on a paper towel to keep your clay clean.

CLAY MOLDS

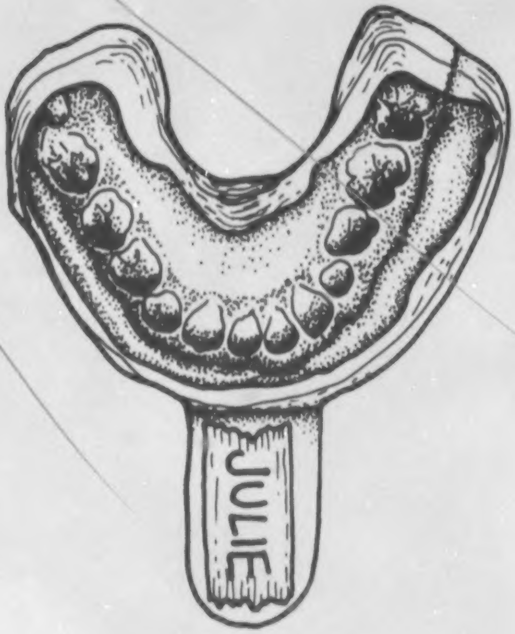
Materials for one set of molds:
1 set of plastic mouth trays (upper and lower)
1/5 of a one-pound clay block
1 sheet of mirrored plastic

Making the Clay Molds

1. Unwrap the clay block.
2. Take 1/5 of the block, and break it into two equal portions. (One half is for your upper mold, and the other half is for your lower mold.)
3. Mold the clay into the mouth trays.
4. Moisten all your teeth with your tongue.
5. Look in the mirrored plastic while you position the lower tray in your mouth.
6. With both hands, push down on the tray until all of your lower teeth, both front and back, are covered (including the gumline) with clay.
   - While biting down, push the clay down around the gumline, if necessary, to make sure your teeth are covered.
7. Open your mouth slowly so that you don't distort the molds, and remove the clay-mold tray from your mouth.
8. Repeat these steps with the upper clay mold.

Checking for Accurate Clay Molds

1. You should see a *distinct gumline* around each tooth.
2. You should see indentations of grinding surfaces on both upper and lower molars (the back teeth).



3. If your impressions are distorted, blot the clay dry with facial tissues, reshape the clay, and try again.

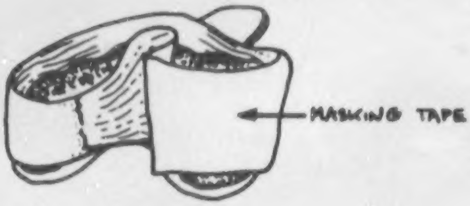
PLASTER IMPRESSIONS

Materials for one set of impressions:
1 set of clay molds in mouth trays
2 plaster mixing bags (Each bag contains 55 ml of plaster.)
water
1 55-ml measuring vial
1.2 meters of wide masking tape

Making the Impressions

Note: Make one impression at a time.

1. Work over a paper towel.



2. Build a "wall" around the mouth tray by wrapping a single layer of masking tape around the tray. Tear off the excess tape. The tape should extend at least one cm above the clay mold. Make sure that your tape wall has no cracks, or the wet plaster will leak out.

3. Fill the measuring vial to the middle line with water, and pour the water into one bag of plaster.

4. With one hand, twist-close the bag at the top.

5. With your other hand, squeeze the bag to mix the water and plaster into a thick creamy liquid. Squeeze the bag thoroughly to get out the lumps.

6. Pour the wet plaster into one end of the mouth tray and rotate the mouth tray to distribute the plaster evenly. Continue adding plaster in this way until all the tooth impressions are filled.

7. Vibrate and tap the plaster-filled mouth tray on the table. Air bubbles will rise to the top.

8. Mix the second bag of plaster and fill your other clay mold.

9. Set the impressions aside to dry overnight.

Removing the Impressions

1. Hit the bottom of the plastic mouth tray on the table to jar the plaster loose from the clay.

2. For easier separation, set the dried impressions near a heater or in the sun for a short time.

3. For exceptionally hard-to-remove impressions, briefly dip the clay-filled trays into warm water.

THE ACTIVITY: PART ONE

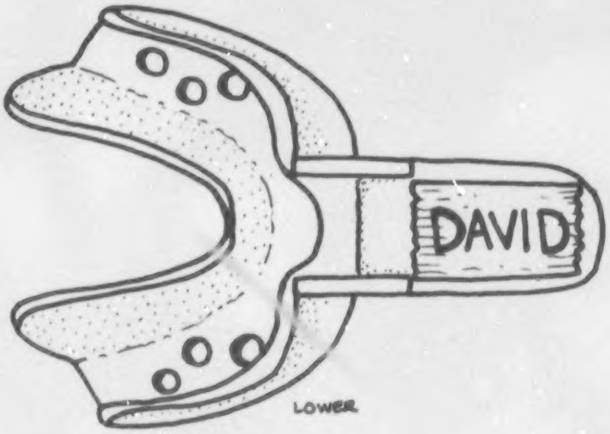
Introducing the Activity

1. Ask the students:
- What functions do your teeth serve? (They bite, chew, allow you to talk and smile.)
- How would the loss of your teeth affect these functions?

2. Explain to the students that they are going to make plaster models of their teeth in order to investigate the shape, size, and functions of their teeth.

Making the Molds and Impressions. A Suggestion: Have students who wear braces make impressions of another student's teeth, your teeth, or those of a passerby that you can commandeer from the hallway.

1. Show the students how to tape name labels to their mouth trays.



2. Demonstrate the clay-mold procedure. (See the Technique Card.)

3. Making the Molds. Tell the students:
- Form groups of four.
- Wash your hands.
- Pick up your materials from a Student Station and make your clay molds.

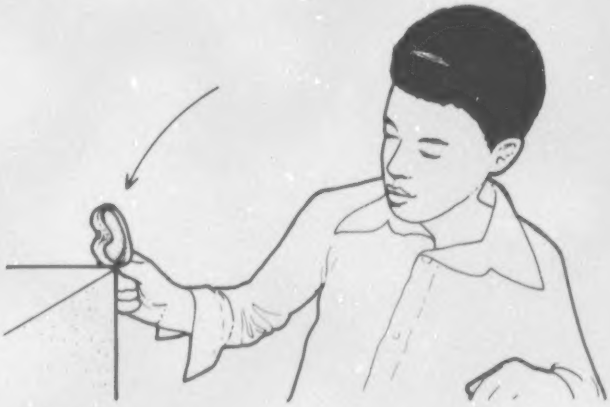
4. After the molds have been made, show the students how to make the plaster impressions. (See the Technique Card.)

5. Making the Impressions. Tell the students:
- Have one of your teammates pick up the team materials from a Team Station.
- Make your impressions.
- Leave the plaster uncovered overnight so that it can dry at room temperature.

6. Give each student a copy of Student Sheet 1 and explain the instructions. Tell the students:
- The first part of Student Sheet 1 is a take-home assignment.
- Bring the completed home assignment back for Part Two.

THE ACTIVITY: PART TWO

Explaining the Plaster-Clay Separation. Show the students how to separate the plaster from the clay and mouth trays. (See the Technique Card.)



Jaws in Action

1. Have the students separate their impressions from their molds.

2. Distribute Student Sheets 2 and 3.

3. Have one member from each team pick up the materials listed on the chalkboard.
- Materials required for each Student Sheet are listed at the top of each sheet.
- Each student uses her own impressions to complete the tasks on each sheet.

4. Have the students complete the Student Sheet tasks.
   - All four team members should finish one sheet before they move on to the next.

Reviewing the Observations. Ask the students to share their findings and observations.

1. For your class or age group, what is the average number of teeth?
2. From your data and those of other classmates, what can you say about the number of teeth that people have at different ages?
3. Why do you think people have two sets of teeth?
4. Were your answers on Student Sheet 2 supported by your experiments?

Cleanup. Ask the students to:

1. Discard the unsanitary clay.
2. Disinfect the mouth trays.

HEALTH APPLICATIONS

1. Suppose someone much younger than you is scared because one of his teeth is loose.
   - What could you do to make him feel better?
2. One of your friends has never been to a dentist and doesn't seem to care about her teeth. She says that she can always get dentures.
   - What do you think about that point of view?
   - What would you say to her?

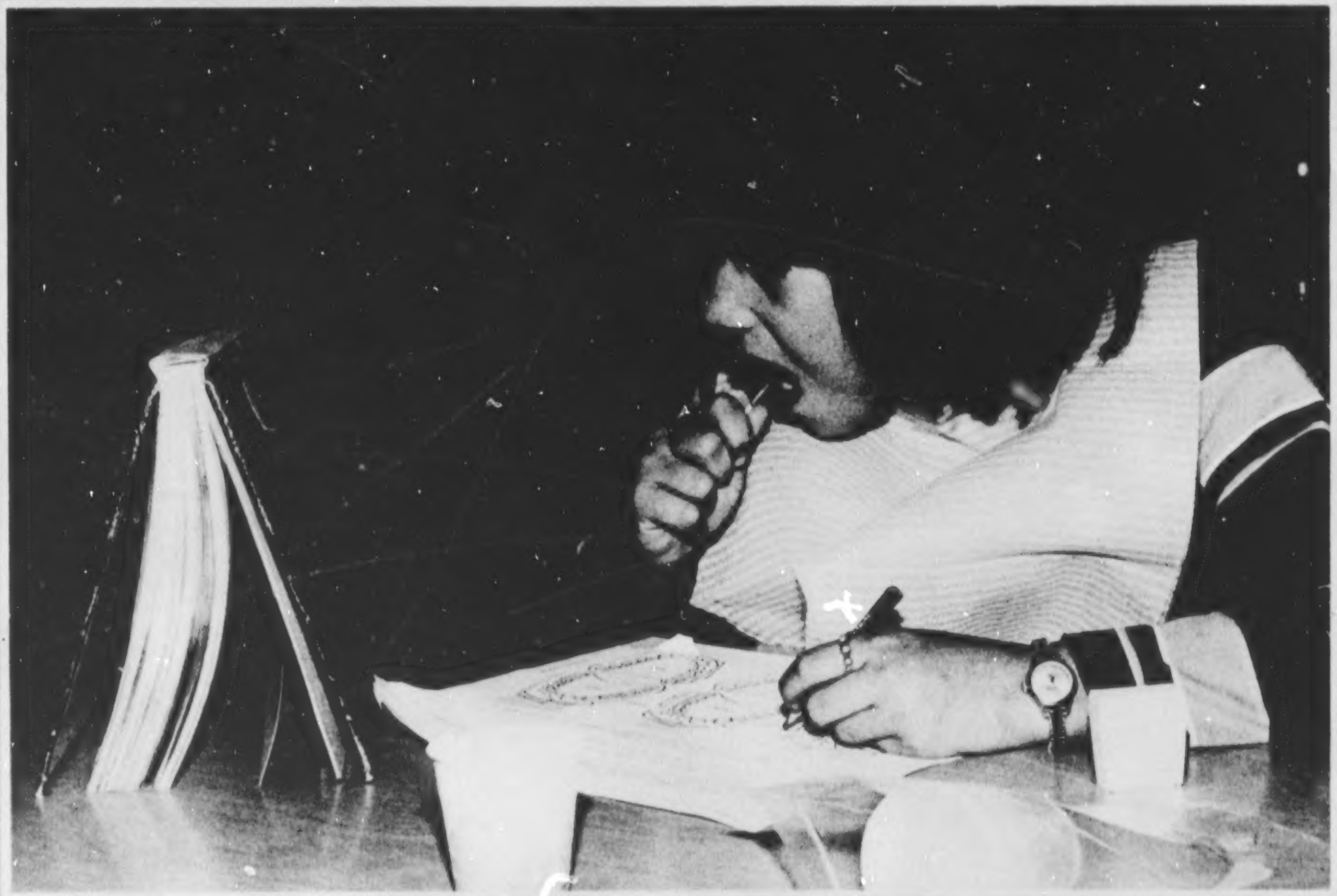
HAP SIDETRIPS

1. Match your classmates' upper impressions to their lower impressions.
   - INITIAL your impressions and cover your initials with masking tape.
   - MIX up your team's upper and lower impressions.
   - EXCHANGE impressions with another team.
   - MATCH uppers to lowers.

The first team to correctly make these matches without looking at the initials wins. What observations or techniques did you use to match the impressions?

2. How do you use your teeth when you talk?
   - Find out which letters of the alphabet you use your teeth to say.
   - With which letters do your teeth touch?
   - With which letters does your tongue touch your teeth?
   - With which letters do your teeth touch your lips?

TROUBLE SPOTS



OVERVIEW

The students temporarily "dye" their teeth to discover where plaque accumulates.

HEALTH BACKGROUND

Plaque, an ever-present film on the teeth, is a major factor in tooth diseases. Bacteria in the mouth, acting on sugars left from food, forms plaque: a sticky, white film of bacteria, saliva, and food debris. This resulting plaque breaks down the sugar in foods, forming an acid that breaks down the tooth enamel. Once the enamel has been penetrated, the tooth rapidly decays. In addition, if plaque is not removed, it can harden into calculus, which damages the gums and other tissues that hold the teeth in place. Regular brushing, flosssing, and annual professional teeth cleanings help control plaque.

Everyone has specific trouble spots on their teeth: places where plaque readily accumulates. Although this film of bacteria covers most teeth surfaces, plaque usually is concentrated near the gum line and between the teeth. In this activity, the students cover their teeth with a dye that temporarily colors plaque, revealing areas susceptible to plaque buildup. By paying particular attention to these areas when they brush and floss, the students can more successfully fight tooth decay.

MATERIALS

For each student:

1 disposable bib
1 toothbrush
1 mouth mirror
3 paper cups
1 colored pencil
1 sheet of mirrored plastic
1 sealable plastic bag
1 30-cm piece of masking tape* (for name labels and "book mirrors")
2 paper clips*
1 hardcover book*
1 "Guide for Flossing and Brushing" Student Technique Card*
1 Student Sheet TS*

For the class:

4 dispensers of dental floss
200 red dots
1 Soaking Station (See the "Disinfecting the Equipment" Technique Card in the *What's HAPpening?* folio.)
1 bottle of red dye *Erythrosine***
3 egg cartons*
butcher paper or newspaper* (optional)
water*
1 "Locating Trouble Spots" class chart
1 duplicator master of "Guide for Flossing and Brushing" Student Technique Card
1 duplicator master of Student Sheet TS

*Provided by the teacher.

***Caution:* The red dye permanently stains clothing and furniture.

SETTING UP

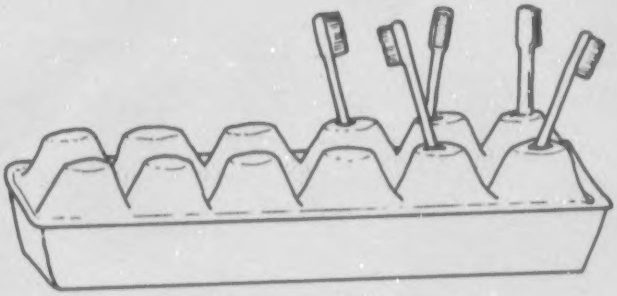
Suggested Time: Plan to conduct the activity on three non-consecutive days.

- Plan for 45 to 55 minutes for Part One.
- Plan for 30 to 45 mnutes for Part Two.
- Plan for 45 to 55 minutes for Part Three.

Preparing for the Activity

1. The Soaking Station. You will need a complete Soaking Station only for Part Three. For Parts One and Two, a bucket of rinse water will suffice. (See the "Disinfecting the Equipment" Technique Card.)

2. Make three toothbrush holders by poking holes in egg cartons. Tape the cartons to a wall in a ventilated area.



3. Before each session:

- Post the Tooth Chart.
- Pour five drops of red dye into a paper cup for each student.
- Set up three distribution stations, each with a third of the materials listed under "For each student" in the "Materials" section. Make a list of these items on the board for student reference.

4. Duplicate the Student Sheet and the flossing Technique Card. (The students will be using the same Student Sheets and Technique Cards on all three days.)

THE ACTIVITY: PART ONE

Introducing the Activity

1. Many students may not know that plaque buildup results from the breakdown of food in the mouth and that some areas are more susceptible to plaque buildup than others. For this reason, define plaque for your students, and then ask the following questions:

- What kinds of food stick to your teeth?
- Where does the food usually stick?
- Do you brush some areas more thoroughly than others?
- How would eating between meals increase the accumulation of plaque?

Name________________________

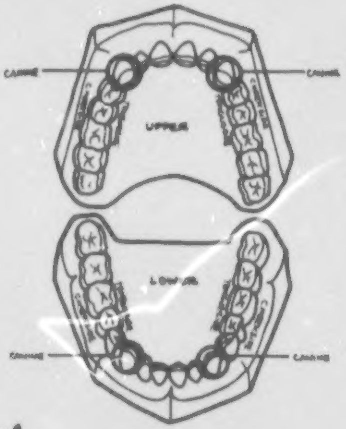
Student Sheet TS

MARKING TROUBLE SPOTS

1. **Marking Your Trouble Spots.** With a colored pencil, mark the trouble spots you find during each session on the appropriate drawing below.
   - Indicate each plaque spot with a dot; do *not* color in a whole tooth just because it has a plaque spot on it.
2. **Marking Your Missing Teeth.** If you do not have all of your permanent teeth, determine which ones you do *not* have by following these steps.
   Step One. Find your own canines.
   - The teeth circled on the drawings are canines. Canines are sharp, pointed, and sometimes look like fangs.

   Step Two. Count the teeth behind your canines, starting from the canines and counting back towards the throat.
   - Put an X on the illustrated teeth that you do not have (teeth in the drawing that remain after you have counted your own teeth).

First Session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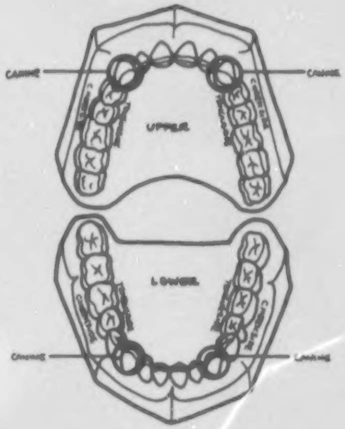
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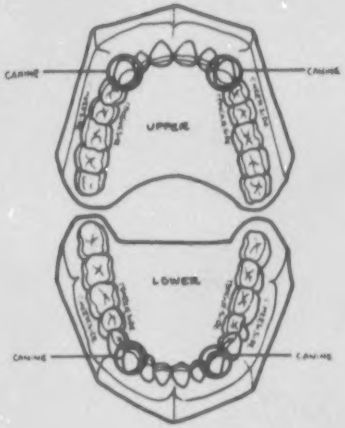
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Trouble Spots
Student Technique Card

GUIDE FOR FLOSSING AND BRUSHING

FLOSSING YOUR TEETH

1. Wrap a 25-cm piece of floss around a finger on both hands.

2. Hold the floss taut, and use your fingers to guide the floss between two teeth.

3. Slide the floss between the teeth using gentle sawing movements. Do not snap or force the floss into tight spots.

4. Curve the floss around a tooth. Keep the floss tight around the tooth and move it from the chewing surface down towards your gums and back up to the chewing surface. Repeat this step several times.

5. Keeping the floss between the same two teeth, curve the floss around the other tooth and repeat step 4. For each tooth, change to a new portion of the floss.

6. If your floss gets caught, let go of one end and slide it through between the teeth.

7. Continue flossing between all of your teeth.

8. After flossing, brush your teeth and rinse your mouth.

BRUSHING YOUR TEETH

1. Start with your upper teeth. Brush the tongue side, the cheek side, and finally the chewing surfaces of your teeth.

2. On the cheek side and tongue side of your teeth, point the bristles toward the gumline and gently vibrate the brush back and forth. Do no scrub or use hard pressure.

3. Brush two teeth at a time, and then move to the next two teeth.

4. For the chewing surfaces of your teeth, point the bristles of your brush into the grooves and scrub.

5. Repeat this pattern with the bottom teeth.

6. Rinse your mouth after brushing by swishing the water between all of your teeth to remove loose food particles.

2. Tell the students that on each of three days they will follow this procedure:

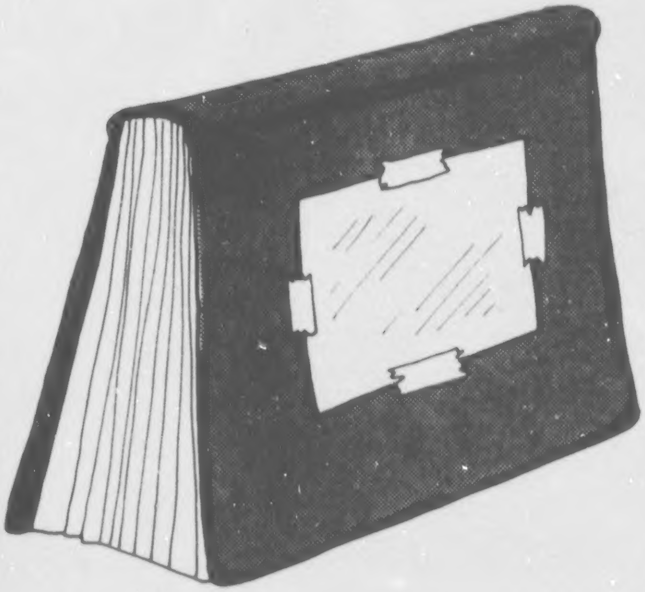
- Locate plaque areas on your teeth using a red dye that turns plaque areas dark pink.
- View all tooth surfaces (cheek, tongue, and chewing sides of the teeth), and mark your plaque areas on your Student Sheet.
- Brush and floss your teeth to remove the dye.

3. Tell the students that today is the first day that they will locate plaque areas on their teeth. The other two sessions will take place when they least expect it.

Demonstrating the Dyeing and Marking Processes

1. Dyeing

- Protect clothing and furniture from the dye by covering work areas with paper and by wearing a bib.
- Make a mirror by taping the mirrored plastic to a book cover.



- Swish the dye from the cup throughout your mouth with your tongue and saliva. Make sure the dye reaches all the tooth surfaces.
- Swallow or spit out the dye. (The dye is non-toxic.)

2. Marking Trouble Spots

- In bright light, inspect all your teeth surfaces with the aid of the mouth mirror and the mirrored plastic.

- Show the students how, on the first set of teeth on a Student Sheet, you would mark your trouble spots using a colored pencil. Explain that you would mark only dark pink areas, not entire surfaces. (The other two sets of teeth are for Parts Two and Three.)

3. Marking Missing Teeth. Explain the marking procedure that appears on the Student Sheet for those students with missing or unerupted teeth.

Finding Trouble Spots. A suggestion: Students wearing braces or with known allergies to the red dye should not dye their trouble spots, but may instead help dye and chart a classmate's trouble spots.

1. Show the students how to tape name labels to their sealable bags, mouth mirrors, and brushes.

2. Distribute copies of the Technique Card, and demonstrate for the students the brushing and flossing techniques.

3. Have the students follow this procedure:

- Pick up your equipment and return to your desks.
- Dye and chart your trouble spots.
- Brush and floss your teeth.
- Check the effectiveness of your brushing and flossing techniques by re-dyeing and inspecting your teeth.

Analyzing the Data. Discuss with the class the comparative effectiveness of brushing and flossing for removing dye-stained plaque.

Cleanup. Have the students follow this cleanup procedure.

1. Rinse the brushes and mouth mirrors, and store them in egg cartons for Parts Two and Three.

2. Discard used floss and paper cups.

3. Store the rest of your equipment in your labeled sealable bag.

THE ACTIVITY: PART TWO

Finding Trouble Spots. On a day when the students least expect it, repeat the dyeing, marking, brushing, and flossing procedures. Make sure each student uses his own labeled equipment.

Analyzing the Data. Ask the students to describe any brushing or flossing adjustments they made after the first part of the activity.

THE ACTIVITY: PART THREE

Finding Trouble Spots

1. Repeat the "Finding Trouble Spots" procedure.

2. Tell the students to circle persistent trouble spots (dye-stained areas on all three days).

3. Have the students put red dots (no more than two per student) indicating their persistent plaque spot(s) on the Tooth Chart.

Analyzing the Data. Ask the students:

1. Where are your trouble spots?

2. How does your plaque pattern compare with those of other students?

Cleanup. Tell the students to disinfect their mouth mirrors (scrub, rinse, and then soak the mirrors in dilute-bleach solution). After soaking the mirrors for at least thirty seconds, the students can dry and store them in a clean plastic bag for future use.

HEALTH APPLICATIONS

While spending the summer with younger cousins, you notice that they are brushing their teeth only when they feel like it.

- What could you do?

HAP SIDETRIPS

1. Make your own dye by using non-toxic commercial food coloring mixed 50/50 with water. With this solution, dye and chart the plaque patters of your parents, brothers, sisters, and friends.

2. Try to remove plaque by chewing on different types of food (carrots, crackers, chewing gum). Repeat the dyeing process, and chart the resulting plaque patterns. Which foods would you say are nature's tooth brushes?

Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

Supported by a grant
from the Robert Wood Johnson
Foundation to the Association of
Science-Technology Centers.

CAVITIES

OVERVIEW

The students play a game that simulates the continuous battle between tooth decay and oral hygiene.

HEALTH BACKGROUND

Tooth decay is a multi-step process. Initially, bacteria in the mouth, acting on sugars left from food, forms ***plaque*** (pronounced "plak"): a sticky white film of bacteria, saliva, and food debris. This plaque then breaks down the sugar in foods, forming an acid that erodes tooth enamel. Once the enamel has been penetrated, the tooth rapidly decays, and a cavity forms. The cavity enlarges as the plaque produces more and more acid. As decay progresses, the tooth may become sensitive to heat and cold, and susceptible to infection and painful abscesses.

Plaque is the essential factor in most diseases of the teeth, and forms every day. The number of times we eat and the length of time sugars remain in the mouth affect this formation of plaque and acids. Daily toothbrushing and flossing, and at least a yearly visit to the dentist or dental hygienist are valuable in keeping the teeth free from plaque accumulations.

By playing *Cavities*, the students simulate the process of tooth decay. They experiment with the variables involved in tooth decay and discover how to take better care of their teeth.

MATERIALS

For the class:
4 blindfolds
1 sheet of yellow dots
1 timer
32 plastic chips
4 sheets of paper*
*Provided by the teacher.

SETTING UP

Suggested Time:

- Plan for 30 to 40 minutes for the activity.

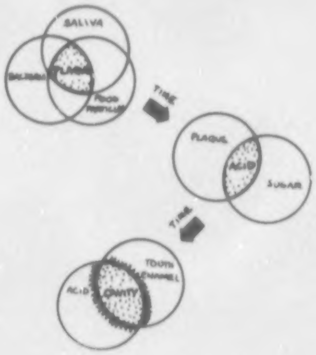
Preparing for the Activity

1. The day before the activity, choose a site that is large enough to contain all the students sitting an arm's length apart from each other in a circle (in chairs or on the floor).
   - You will need at least twenty students for this activity.
   - If the students will be sitting on the floor, advise them to dress accordingly.
2. Fold and cut each of the four sheets of paper into eight equal pieces. Number the resulting cards from 1 to 32.
3. Cut the sheet of dots into strips of dots.

THE ACTIVITY

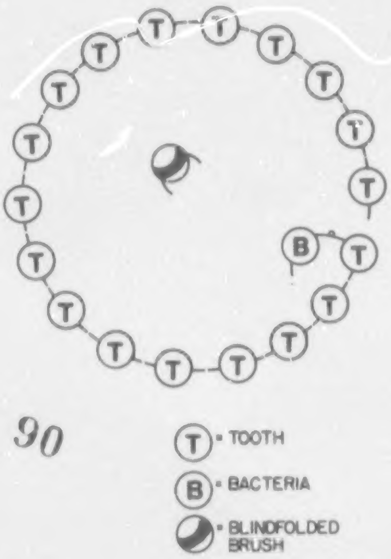
Introducing the Activity

1. Ask the students:
   - What are cavities?
   - What causes cavities?
   - What do you think prevents cavities from forming?
2. Draw the illustrated diagram on the board, explaining that it represents the major steps in the decay process. Make sure the students understand the sequence of tooth decay.



Setting up the Game

1. Ask the students to sit an arm's length apart from each other in a circle.
   - Starting with any student in the circle, ask the students to count off ("One, two, three . . . thirty-two") and to remember their numbers.
2. Explain that the circle of students represents the mouth, with each student in the circle representing a TOOTH.



3. Randomly distribute plastic chips (one chip for every three students).

- The chips represent the sugar and food particles that usually remain in the mouth after each meal or snack.
- During the game, the students pass the chips around the circle.
- They may pass the chips to the left or right, quickly or slowly, into their neighbors' hands.
- Hands must be kept in front of the players, and the chips may not be tossed.
- The students may pass or hold more than one sugar chip at a time.

4. Pull a numbered card at random from the deck, and call out the number. The student with that number will be the BACTERIA.

- Give the BACTERIA ten yellow dots, which represent plaque spots.
- During the game, the BACTERIA moves within the circle and tries to put as many plaque spots on the teeth as possible.
- In order to make a plaque spot on a TOOTH, the BACTERIA must touch the hand of a TOOTH while the TOOTH holds a sugar chip.
- When the BACTERIA touches a TOOTH that is holding one or more sugar chips, the TOOTH must give the sugar chip(s) to the BACTERIA.
- The BACTERIA then sticks a plaque spot on the back of the TOOTH's hand for each sugar chip the TOOTH was holding.

5. Randomly select another numbered card. The student with this number will be the BRUSH.

- The BRUSH, wearing a blindfold, moves within the circle and tries to tag the BACTERIA before the BACTERIA can leave plaque spots on the TEETH.

6. Tell the students that the game lasts for two minutes, which represents one day. The game must be played entirely within the circle (the mouth).

7. Determining the Winner. The presence or absence of "cavities" determines the winner. Two plaque spots represent a cavity.

- The BACTERIA wins if he places two plaque spots on at least one TOOTH before the timer sounds.
- The BRUSH and TEETH win if the BRUSH tags the BACTERIA before the BACTERIA can place two plaque spots on any one TOOTH.
- The game is a draw if the BACTERIA has not "made a cavity" and the BRUSH has not tagged the BACTERIA before the timer sounds.

Playing the Game

1. Ask the BRUSH to put the blindfold on. Have the BACTERIA and the blindfolded BRUSH stand inside the circle of TEETH.

2. Tell the BACTERIA to close his eyes and to wait for your "Start" signal before opening them.

- Tell the TEETH to start passing the sugar chips.
- Encourage fake passing to distract the BACTERIA from those TEETH actually holding or passing the sugar chips.
- The TEETH must pass the chips quietly so the BRUSH can hear the movements of the BACTERIA.

3. Give the starting signal, set the timer for two minutes, and let the game begin.

- Play three rounds with different BACTERIA and BRUSHES.
- After each round, collect the sugar chips and redistribute them for the next round.
- Record the winner of two out of the three rounds on the board.

4. Changing the Rules. Ask the students to suggest rule changes that might affect the number of cavities that form in the two-minute day, and write the suggestions on the board. Suggest these changes if the students do not offer any:

- Change the number of BACTERIA or BRUSHES.
- Change the number of sugar chips.
- **Delayed Brushing.** For the first minute, let the BACTERIA work alone. Then let the BRUSH try to catch the BACTERIA during the second minute.
- **Brushing After Every Meal.** For the first minute, let the blindfolded BRUSH work alone, trying to collect sugar chips in the same way as the BACTERIA. Then let the

BACTERIA come in during the second minute. The BRUSH should then try to catch the BACTERIA as she did in the original game.

- Provide a safety zone or hiding spot (e.g. behind a TOOTH) for the BACTERIA to stand where he (or they) cannot be caught.

5. Have the class decide which rule to change in each game.

- Each new game should be played with only *one* rule changed.
- Select new BACTERIA and BRUSHES for each game.
- Play each variation three times and decide who the winner is.
- Record the winner on the board.

	DESCRIPTION OF VARIABLE	WINNER
TRIAL 1	TWO BRUSHES	TEETH AND BRUSHES
" 2		
" 3		
" 4		

- Encourage the students to compare game results after each rule change.

Analyzing the Results. Briefly review the results of the game variations and then ask the following questions:

1. How many plaque spots and cavities were formed?

2. What made the biggest difference in whether cavities were formed or not?

HEALTH APPLICATIONS

We have all heard about brushing to prevent tooth decay, but what are other things we can do to stop cavities from forming?

HAP SIDETRIPS

1. Start a game with lots of plaque spots already on the students to find out how difficult it would be to prevent cavities in a plaque-laden mouth.

2. If you did not have an opportunity to play the variations explained in step 4 of "Playing the Game," use some as Sidetrips.

3. Have the class select one or two students to teach the game to another class.

- What were their results?
- Compare their results with your class results.

EXPLORING HEARTBEATS

OVERVIEW

The students use stethoscopes to locate the position of their hearts and to listen to their heartbeats.

HEALTH BACKGROUND

The heart is a muscle that contracts and relaxes about 100,000 times a day. A strong heart is essential to a healthy body because it pumps blood to the tissues, where the blood distributes food and oxygen and removes waste products such as carbon dioxide. The heart valves open and then slam shut, producing a distinctive "lub-dub" sound, which can be heard with a stethoscope held near the heart. This instrument picks up and carries the sounds of the heart valves to the ears.

Use of the stethscope will familiarize the students with the periodic sounds of the heart, enhance their understanding of heart location and action, and prepare them for the blood pressure activities that follow this activity.

MATERIALS

For each student:
1 Student Sheet EH*

For the class:
1 Wiping Station (See the "Disinfecting the Equipment" Technique Card in the *What's HAPpening?* folio.)
16 HAP stethoscopes
1 clock*
1 pencil or ruler*
duplicator matter of Student Sheet EH

*Provided by the teacher.

SETTING UP

Suggested Time:

- Plan for 20 minutes for Part One.
- Plan for 40 minutes for Part Two.

Preparing for the Activity

1. Make sure that your clock discriminates one-minute intervals. It should have a second hand (or a minute hand that clicks or jumps each minute) that every child can see. Place the clock in a conspicuous spot.

2. Set up one Wiping Station as described on the "Disinfecting the Equipment" Technique Card.

3. Duplicate Student Sheet EH.

THE ACTIVITY: PART ONE

Introducing the Activity

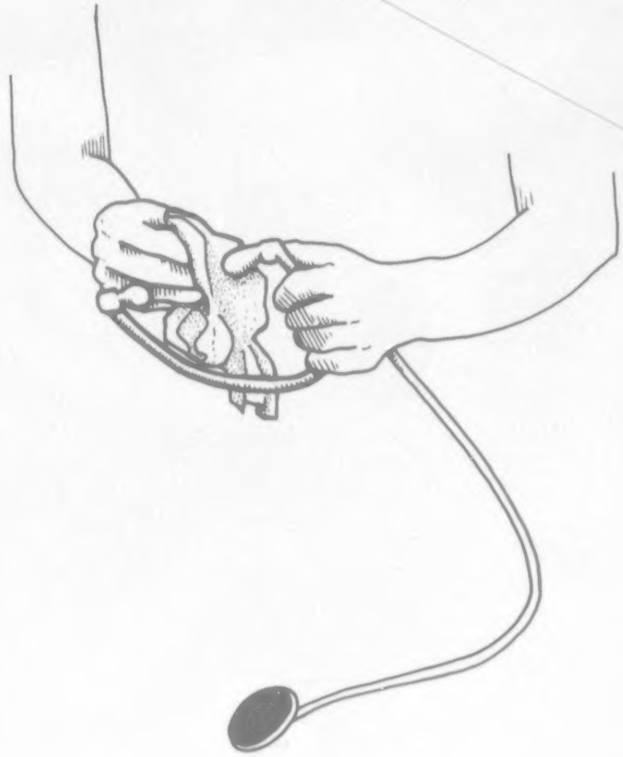
1. Show the students a stethoscope and tell them the name of the device.

2. Tell the students that they will use the stethoscope to listen to the sound of their heartbeats, a sound they cannot hear very well without a stethoscope. (You might wish to inform the students that *stetho* means "chest," and *scope* means "to view.")

Demonstrating the Proper Use of the Stethoscope

1. Thoroughly wipe each earpiece with a piece of paper towel moistened with the dilute-bleach disinfectant.

- Explain that the earpieces should be cleaned before each use.



Name_______________________ Student Sheet EH

WORKING WITH THE STETHOSCOPE

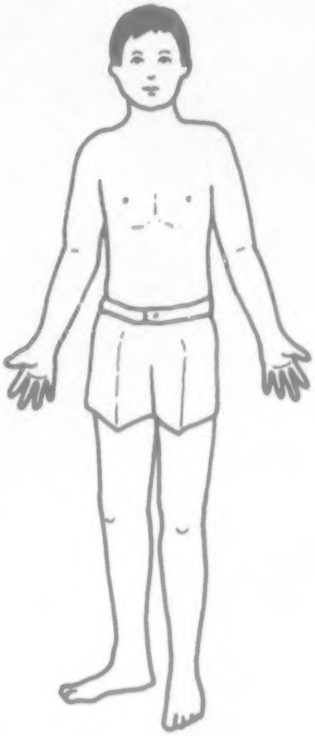
PART ONE: FINDING SOUNDS

1. Using the stethoscope, listen for sounds in different places around the room.
   - You are trying to detect sounds that you can't easily hear with your unaided ear.
2. Record the places where you listen and the sounds that you hear.
3. Take turns with your partner. Each time you use the stethoscope, wipe the earpieces before putting them in your ears.

PLACE	WHAT SOUND DID YOU HEAR?	WAS IT LOUD OR SOFT?
1.		
2.		
3.		

PART TWO: FINDING HEARTBEATS

1. Exchange Student Sheets with your partner.
2. Find the spot on your partner's body where you hear the strongest heartbeat.
3. Mark that spot with an "X" on the human-body outline on this page.
4. Count your partner's heartbeats for one minute. Record the number in the blank.
   __________ beats per minute.
5. Describe your partner's heartbeat.
   ____
   ____
   ____
   ____
6. Can you hear any sounds from the heart other than the lub-dub sound? __________
   ____
   What do they sound like? ______________
   ____



2. Face away from the class to demonstrate the proper way to wear the stethoscope.

- The earpiece with the flexible tube is always placed in the right ear. (The earpieces then point slightly forward, matching the ear canals.)
- Caution the students against banging or pressing on the diaphragm (black disk) when someone is wearing the stethoscope. Such action could damage the ears of the listener.

Exploring with the Stethoscope

1. Distribute copies of the Student Sheet, and give the students time to read Part One.

2. Challenge the students to find sounds around the classroom and to record their results on the Student Sheet.

- Form teams of two students. (Pair girls with girls and boys with boys now to avoid problems that may arise in Part Two.)
- Let each team pick up a stethoscope and two paper towels wet with disinfectant.
- Let the students search for sounds for about ten minutes.

3. Discuss the results informally after the exploration.

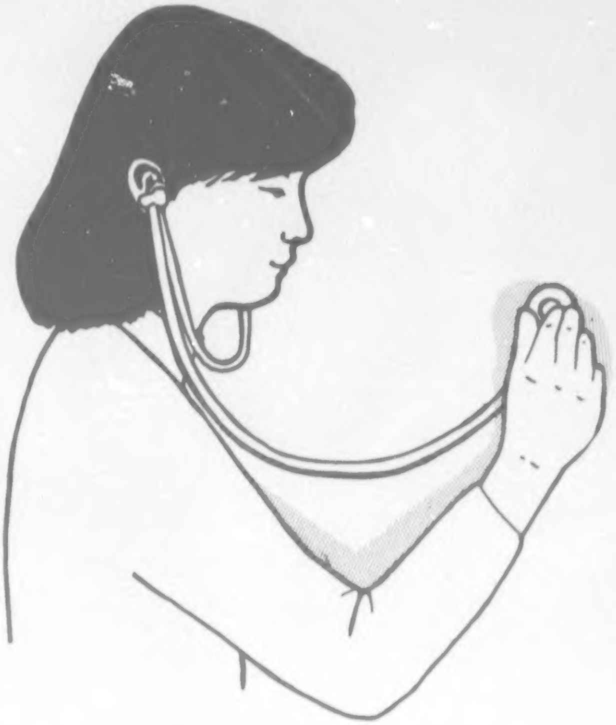
Practicing the Counting Procedure

1. Select a sounding board such as a wall, long table, counter top, or window sill.

- Ask the students to line up along the sounding board.

2. Tell the students that you are going to tap on the board lightly with a pencil or stick.

- While you tap, each student with a stethoscope should place the diaphragm on the surface of the board, close his eyes, and count your taps.



3. Start tapping.

- Conduct several tapping sequences in which you tap twenty to thirty times at regular intervals (tap, tap, tap . . .).
- For at least one sequence, tap very lightly so that the students will learn to listen carefully for weak sounds (such as a heart sound).
- For the last few sequences, try to simulate a "lub-dub" pattern (tap-tap, pause, tap-tap, pause . . .), and ask the students to count each tap-tap as one beat.
- Make sure to get student agreement on the tapping counts now, or difficulties will be compounded later.

4. Conduct a second counting session for the remaining students.
  - Remind them to wipe the earpieces.

THE ACTIVITY: PART TWO

Finding, Counting, and Comparing Heartbeats

1. Tell the students that they will now search for their partners' heartbeats by placing the diaphragm of the stethoscope against the body at different locations.

2. Have the partners trade Student Sheets.

3. Explain that each student should find the place on his partner where he hears the strongest heartbeat, and mark that spot on his partner's Student Sheet body outline.

4. Let the students begin, encouraging them to follow the Part Two instructions on the Student Sheet.
  - Tell them that when they count their partners' heartbeats, to count the "lub-dub" sound as one heartbeat.

Analyzing the Results. The following questions may be useful in summarizing the activity.

1. How effective is the stethoscope in allowing you to detect sounds?

2. What do heart sounds sound like?

3. Where do you hear the heart sounds?
  - Where do you hear the strongest heart sounds?

4. What were some of the heartbeat rates? (You might record ten to fifteen on the chalkboard.)

HEALTH APPLICATIONS

1. Why might checking your heart rate be a good idea?

2. A person's resting heartbeat rate increased from 80 to 100 beats a minute over two years. How could you find out if this is normal?

HAP SIDETRIPS

The following challenges can be used by interested students or the entire class to explore heartbeats further.

1. Determine the heartbeat rates of older people to learn if they have higher or lower heartbeat rates than you have.

2. How many times will a heart that is beating at 60 beats per minute beat in an hour? A day? A year? Ten years?

3. The heart is about the size of a fist and beats day and night. How long can you clench and open your fist at the same rate that your heart beats?

4. Is your heartbeat rate different at different times in a day? When is it the fastest? The slowest?

5. What is your heartbeat rate before you eat, while you are eating, and after eating?

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EXPLORING BLOOD PRESSURE

HEART/RESPIRATION Module

HAP
SPHYGMOMANOMETER
220
200
180
160
140
120
100
80
60
20
0
HUBBARD

OVERVIEW

The students discover that their blood is under pressure and that blood pressure fluctuates with the beating of the heart.

HEALTH BACKGROUND

Blood pressure is a common term to most people, yet many do not understand its meaning. The heart's pumping action creates pressure in the arterial system. This pressure is greatest in the aorta, the largest artery through which blood leaves the heart, and decreases throughout the arterial system and capillaries until pressure reaches zero in the veins.

At any one point in the arterial system, such as the brachial artery (in the arm), blood pressure fluctuates. With each beat the heart pumps blood, producing a sudden increase in blood volume, which momentarily raises arterial blood pressure. This high value is called ***systolic pressure.*** Between heartbeats, the blood continues to flow through arteries, through the capillaries and veins, and then reenters the relaxed heart, reducing blood pressure in the arteries. This low pressure, caused by the elasticity of the arteries, is called ***diastolic pressure.***

MATERIALS

For each group of four:

1 HAP sphygmomanometer (cuff and bulb, tubing and pressure gauge)
1 HAP stethoscope
paper towels*
paper and pencils*

For the class:

1 Wiping Station (See the "Disinfecting the Equipment" Technique Card in the *What's HAPpening?* folio.)
1 "Using the Blood Pressure Equipment" Technique Card

*Provided by the teacher.

SETTING UP

Suggested Time: Conduct *Exploring Heartbeats* before presenting this activity.

- Plan for 20 to 30 minutes for Part One.
- Plan for 20 to 30 minutes for Part Two.

Preparing for the Activity

1. Set up the Wiping Station as described on the "Disinfecting the Equipment" Technique Card.

2. Consult the "Using the Blood Pressure Equipment" Technique Card for instructions on setting up the equipment.

THE ACTIVITY: PART ONE

Introducing the Activity. Initiate the activity by finding out how familiar the youngsters are with pressure in objects they encounter in their everyday life. Ask the students:

1. What are some objects that contain pressure? (Football, tire, balloon.)

2. What happens to the air pressure in a basketball if more air is added?

3. Do you think your blood is under pressure? What evidence can you give for your answer?

Demonstrating the Use of the Pressure Gauge

1. Explain to the students that they will be working with a device that measures pressure.

2. Show the students how to "zero" the pressure gauge. (Refer to the Technique Card.)

3. Now tell the students to watch the column of liquid as you blow through the tubing into the pressure gauge.

- What happens to the liquid?
- Tell the students *not* to open the zeroing valve while the system is pressurized. (Otherwise the fluid will squirt out.)

Creating Pressure by Blowing

1. Challenge the students to raise the column of liquid to between 50 and 70 by blowing into the tube, and to keep the column within this range as long as they can.

- Remind the students to "zero" the gauge before each trial, and to wipe the end of the tubing with dilute-bleach solution before a new team member blows on the tube.
- A teammate should record the number of seconds a team member was able to hold the pressure between 50 and 70.
- Each student should have three trials, the first one being a practice trial.
- Divide the class into groups of four students, give one pressure gauge to each of the groups, and let them begin.

2. Challenge the students to determine their maximum lung pressure. Tell each student to follow this procedure:

- Blow as hard as you can into the tube.
- Record the highest pressure value that you can maintain for *three seconds*.

Analyzing the Data

1. Ask the students:

- What do you think the rising column of liquid indicates?
- Why do you think you couldn't keep the column of liquid raised any longer than you did?
- Why couldn't you raise it any further?

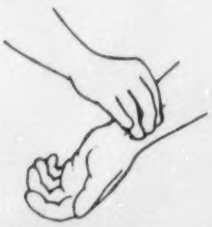
2. Explain that pressure is the result of force against a resistance. For younger children, explain that pressure is the push against something that doesn't give.

THE ACTIVITY: PART TWO

Introducing the Idea of Pressure in Pulse

1. Introduce this part of the activity by showing the youngsters how to feel their pulse.

- Arch the first three fingers of one hand, and place the finger tips between the center of the wrist and the bone on the thumb side of your other wrist.



- Assist those students having difficulty locating their pulse.

2. Ask the students what they think is happening that creates a pulse that they can feel.

- If they don't suggest a periodic pressure or a surge of pressure, tell them that the blood is under pressure (blood pressure).

3. Tell the students that they can use the *sphygmomanometer* to find out how their blood pressure is related to their pulse.

- You can tell the youngsters that *sphygmo* means pulse, and a *manometer* is an instrument for measuring pressure.

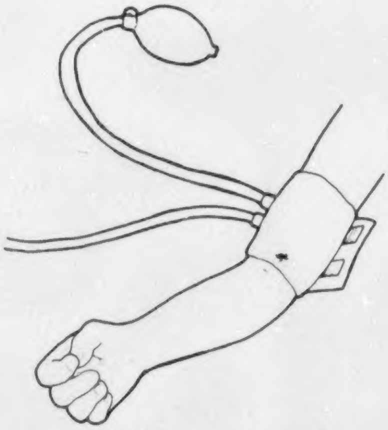
Demonstrating the Procedure

1. Show the students how to assemble the apparatus:

- Idenfity the cuffs and bulbs.
- Insert the tubing of the pressure gauge into either of the two cuff connectors.

2. Select a student to assist you in demonstrating the proper use of the equipment.

- Place the cuff properly on the student's arm. (See the Technique Card.)



- Close the valve on the bulb by turning it clockwise until it stops.
- Slowly pump the bulb until the column of liquid rises to approximately 100. (If you wish, explain that the 100 value represents 100 millimeters of mercury pressure, the same unit of measurement in equipment used by doctors and nurses.)
- Tell the students to watch for movement of the fluid at the 100 mark (an indication of pressure change).

- The students may also want to check the fluid-level movement at several other pressures.
- Caution the students that *at no time should they inflate the cuff so that the liquid rises above 200.*
- Also, *no student should wear an inflated cluff longer than one minute.*

3. Release the pressure in the in the cuff by turning the valve counterclockwise.

4. Remove the cuff from the student's arm.

Determining the Effect of the Pulse on the Fluid

1. Explain that each group member will now find out how his pulse affects the column of liquid.
   - Each group member takes a turn at wearing the inflated cuff on his arm.
   - Another group member counts aloud the student's pulse, taking it from the wrist. (Each group member should also take a turn at counting.)
   - The group watches to see what the fluid level does as each count is called.
2. Give each of the groups a cuff, bulb, and gauge, and let them begin.
3. When the students have finished, explain that now they will compare the rhythm of their heartbeat sounds to the liquid movement in the gauge.
   - Each group member again takes a turn at wearing the inflated cuff.
   - Another group member uses the stethoscope to listen to the student's heartbeat, counting beats out loud as she hears them. (Again, each student should take a turn counting.)
   - The group again watches to see what happens to the fluid level with each beat.
   - Tell the students to wipe the stethoscope earpieces with a paper towel and the dilute-bleach solution between uses.
4. Give each group of four a HAP stethoscope, and let the students begin.

Analyzing the Data. Ask the students:

1. What do you think caused the fluid to bob up and down?
2. Did the pulse at the wrist and the movement of the fluid always occur at the same time?
3. Did the sound of the heartbeat and the movement of the fluid always occur at the same time?

HEALTH APPLICATIONS

Someone is attempting to revive a friend of yours who has nearly drowned. The person giving the cardio-pulmonary resuscitation (CPR) is working on the victim. He asks you to count the victim's heartbeats.

- How could you do it?

HAP SIDETRIP

Find out the highest and lowest cuff pressures at which the column of liquid moves with your pulse.

- Put on the cuff and slowly inflate it. Note the pressures at which movement starts and stops. Do not inflate the cuff over 200. (Pressures obtained in this manner usually fall within 65 and 130.)
- Compare your range with the ranges of other students.

Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

HAP III

Trial Edition

Supported by a grant
from the Robert Wood Johnson
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Science-Technology Centers.

HIGH BLOOD PRESSURE

OVERVIEW

The students conduct a simulation in which they compare the work loads that normal and high blood pressures place on the heart.

HEALTH BACKGROUND

Cardiovascular disease, which is the leading cause of death in the United States, most commonly results from hypertension (sustained high blood pressure). Untreated hypertension may lead to strokes, heart attacks, angina pectoris (severe chest pain), or failure of other vital organs (such as the kidneys) due to damaged blood vessels.

Hypertension usually has no single cause, but stems from a combination of life style, diet, and inherited tendencies. Because the symptoms of hypertension are usually painless and undramatic, many cases go unnoticed. Only about half of the victims of hypertension are aware of their condition, while only one-tenth are receiving adequate treatment. Such treatment requires long-term changes in behavior, life style, and diet. Even under treatment, many patients fail to follow medical instructions because they see no improvement on a daily basis.

By comparing the workloads produced by simulated *normal* and *high* blood pressure changes, the students increase their awareness of blood pressure and the effect of hypertension on the cardiovascular system.

MATERIALS

For each group of four:

1 HAP sphygmomanometer (cuff and bulb, tubing and pressure gauge)
1 long balloon

For the class:

1 "Using the Blood Pressure Equipment" Technique Card from the *What's HAPpening?* folio.

SETTING UP

Suggested Time: Conduct *Exploring Heartbeats* and *Exploring Blood Pressure* before presenting this activity.

- Plan for 10 to 15 minutes for Part One.
- Plan for 20 to 30 minutes for Part Two.

Preparing for the Activity. Consult the "Using the Blood Pressure Equipment" Technique Card for instructions on setting up the apparatus.

- Connect the cuff and bulb, tubing, and pressure gauge as described.
- Although the students will not be *wearing* the cuffs in this activity, the assembly procedure remains the same.

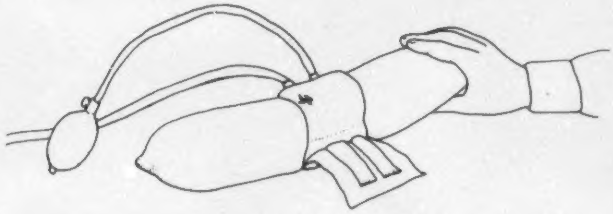
THE ACTIVITY: PART ONE

Introducing the Activity

1. Briefly review *Exploring Blood Pressure* with the students.
   - Ask them what caused the column of liquid in the gauge to pulsate with each heartbeat.
2. Tell the students that because they cannot examine their arteries, they are going to pretend that a balloon is an artery.
   - Explain that they can use a balloon to simulate the pulsating blood pressure they observed in *Exploring Blood Pressure*.
   - Do not mention wrapping the cuff around the balloon.
3. Show the students how to inflate a long balloon by filling one about three-fourths full of air and tying the end in a knot.

Simulating Arterial Pressure

1. Challenge the students to find a way, using the balloon, to make the liquid in the gauge pulsate as it did when they were wearing the cuffs on their arms.
   - Divide the class into groups of four.
   - Give each group a gauge, cuff and bulb, and a balloon.
   - Give the students time to experiment.
2. If the students can't figure out what to do, suggest that they put the cuff around the middle of the balloon and inflate the cuff until the gauge reads 100.



   - Ask a student to rhythmically squeeze and release one end of the balloon.
   - Tell the students to observe what happens to the column of liquid in the pressure gauge.
   - Ask another student to put his hand on the other end of the balloon and take the "pulse" of the balloon.
   - Give each team member the opportunity to take the "pulse" of the balloon.
3. Collect the balloons.

Analyzing the Data

1. Tell the students that they have just simulated changes in pressure that take place in the arteries. To help the students understand the simulation, ask them what each part of the simulation represents.
   - The air? (Blood.)
   - The balloon? (Artery.)
   - The squeezing hand? (Heart.)
2. Ask the students to use the simulation as a guide in answering the following questions.
   - What must be happening to your blood vessels that allows you to feel your pulse? (The vessels expand and contract as the heart beats.)

- Keeping in mind the bouncing of the liquid, what do you think happens to your blood pressure each time your heart beats?
- How do you think the "pulsing" in the column of liquid would be related to the pulse that you feel in your wrist?

THE ACTIVITY: PART TWO

Introducing Part Two

1. Tell the students that arteries, like a balloon partially filled with air, always have pressure in them.

2. Holding up one of the partially filled balloons, ask the students:
  - What keeps the air in the balloon? (The rubber skin of the balloon.)
  - What part of the artery does the balloon represent? (The artery walls.)

3. Explain to the students that, as the elasticity of a tied balloon keeps air inside under pressure, the elasticity of the arteries creates a constant pressure inside the arteries.

4. Ask the students what would happen if you cut or punctured a balloon filled with water.
  - Why? (The pressure is released.)
  - What would be a similar situation involving an artery?
  - If the students don't come up with the answer, mention that blood squirts out of a cut artery.

5. Squeezing the balloon, ask the students what they think is happening to the pressure in the balloon. Ask them:
  - Imagining that my hand is the heart, and the balloon is an artery, what happens to the pressure in arteries when the heart contracts?

6. Explain to the class that there is a higher pressure when the heart is pumping and a lower pressure in between pumps.
  - These two pressures account for the two numbers that appear in blood pressure readings. An *average* normal blood pressure measurement would be 110/70 (read "110 over 70").
  - The 110 value is the pressure created in the brachial (arm) artery when the heart contracts. (Each contraction is called a *systole*, pronounced SIS-tuh-lee.)
  - The 70 value is the pressure that exists in the brachial artery as the heart relaxes. (Each relaxation, or expansion, is a *diastole*, pronounced die-ASS-tuh-lee.)
  - **Note:** 110/70 is an *average* normal blood pressure. Blood pressure varies with such factors as age, weight, condition, etc. "Normal" blood pressure extends over a range of measurements.

Demonstrating the Simulation of Blood Pressure. Show the students how to simulate the normal (110/70) up-and-down change in blood pressure that is created by the pumping of the heart.

1. With the cuff on the table, close the valve and inflate the cuff to 70. Explain that this simulates the lowest pressure in the brachial artery (diastolic pressure).

2. Squeeze the cuff with your hand until you raise the pressure to 110. This represents the increase in blood pressure caused by each contraction of the heart (systolic pressure).

3. Take your pulse to find its approximate rate.

4. Now squeeze the cuff for at least thirty seconds at the same rate as the beating of your heart. Make sure the pressure reaches 110 each time you squeeze.

5. Tell the students to make a mental note of how hard they squeeze to make the pressure reach 110.

Simulating "Normal" Blood Pressure

1. Challenge the students to simulate a normal blood pressure of 110/70.
  - The students remain in their same groups.

2. Make sure each student has the opportunity to simulate the work the heart does under normal-blood-pressure conditions.

3. Circulate among the students and assist them if necessary.

Simulating High Blood Pressure

1. Ask the students how they think having high blood pressure (hypertension) would affect their hearts.
   - Tell them that they can experience the effect of a mildly high blood pressure by raising the cuff pressure to 100 and squeezing to a pressure of 140.
2. Have the students simulate this high blood pressure.
   - Ask them to compare the amount of work involved in this simulation to the work involved for 100/70.
3. **Optional.** Some people have dangerously high blood pressure as great as 180/120. Ask the students to:
   - simulate a blood pressure of 180/120.
   - compare the amount of work needed to create this high pressure to work done to create the two lower pressures.

Analyzing the Results

1. When blood pressure increases, what happens to the amount of work the heart must do?
2. Why is maintaining normal blood pressure important to your health?
3. What do you think high blood pressure does to the walls of blood vessels?

HEALTH APPLICATIONS

1. Many people have high blood pressure and are not even aware of it. What can you do to find out if you have high blood pressure?
2. Arrange an open-house night at your school to test your parents' blood pressure.
3. What do you think might happen to a person with high blood pressure?

HAP SIDETRIP

How does increasing the amount of air in the balloon affect the Simulating Arterial Pressure exercise?

- Completely fill the balloon with air.
- How hard do you have to squeeze to obtain the same results?

Health Activities Project
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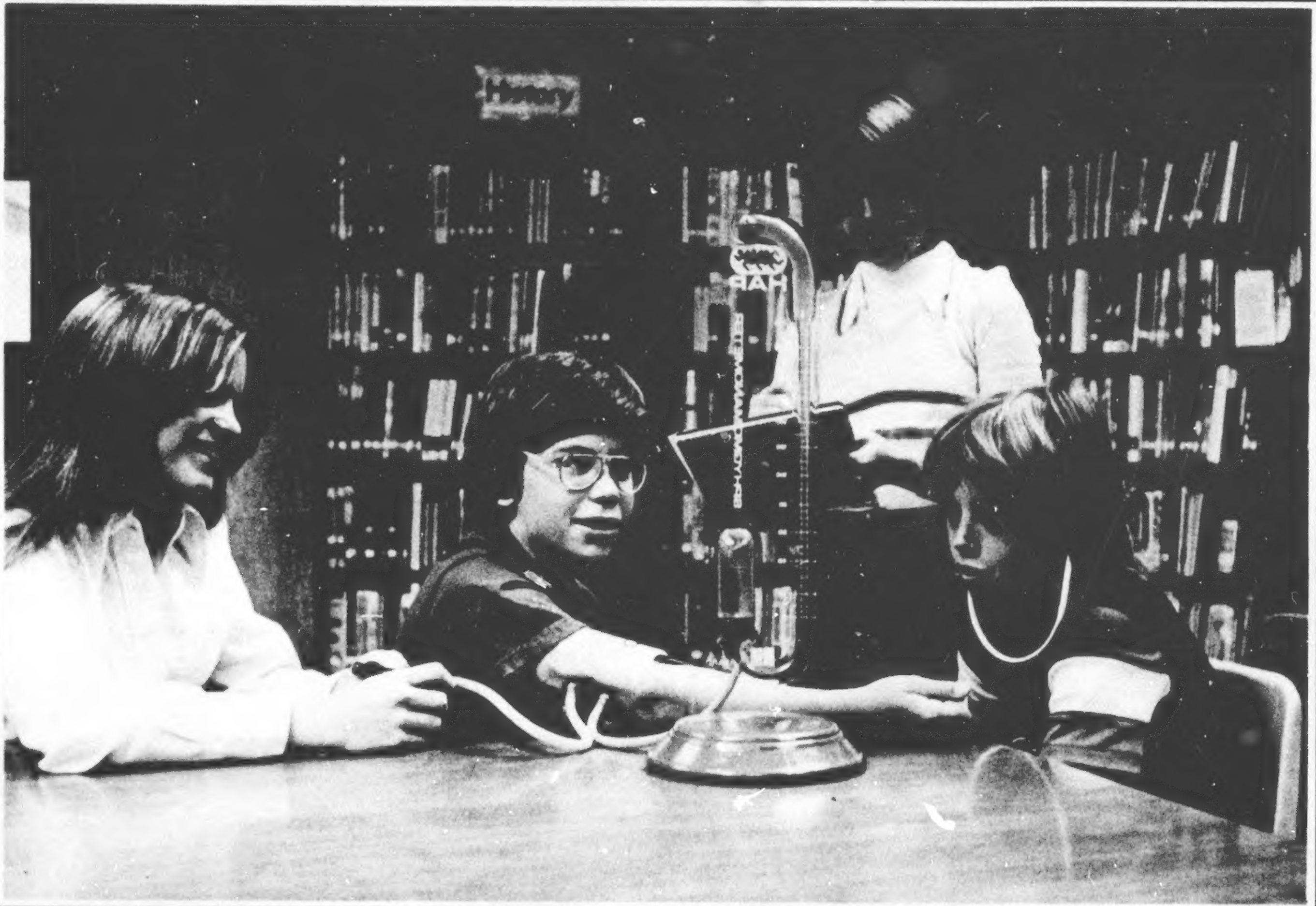
MEASURING BLOOD PRESSURE

HEART/RESPIRATION Module



OVERVIEW

The students measure their blood pressure.

HEALTH BACKGROUND

Hypertension (sustained high blood pressure) is the leading cause of stroke, heart failure, and kidney failure. Cardiovascular disease, the leading cause of death and disability in the United States, most commonly results from hypertension. The government estimates that more than 23 million people have high blood pressure. Other estimates are as high as 40 million. Current studies indicate that 1 to 2% of U.S. children, 2 to 11% of high school teenagers, and 20% of college students have high blood pressure.

Measuring your blood pressure is the proven method of determining if you have hypertension. The procedure is easy, requires very little time, and is painless. Blood pressure is typically measured with a sphygmomanometer at the brachial artery in the upper arm.

Treatment for high blood pressure can effectively reduce your chances of death and disability. The importance of identifying and treating high blood pressure cannot be overestimated.

MATERIALS

For each student:
1 Student Sheet MBP*

For each group of four students:
1 HAP sphygmomanometer (cuff and bulb, tubing, and pressure gauge)
1 HAP stethoscope
paper towels*

For the class:
1 Wiping Station (See the "Disinfecting the Equipment" Technique Card in the *What's HAPpening?* folio.)
1 "Using the Blood Pressure Equipment" Technique Card from the *What's HAPpening?* folio.
duplicator master of Student Sheet MBP

*Provided by the teacher.

SETTING UP

Suggested Time: Conduct *Exploring Heartbeats*, *Exploring Blood Pressure*, and *High Blood Pressure* before presenting this activity.

- Plan for 50 to 70 minutes for this activity.

Preparing for the Activity

1. Consult the "Using the Blood Pressure Equipment" Technique Card for instructions on setting up the equipment.

- Connect the cuff and bulb, tubing, and pressure gauge as described.

2. Duplicate the Student Sheet.

3. Set up the Wiping Station as described on the "Disinfecting the Equipment" Technique Card.

THE ACTIVITY

Introducing the Activity

1. Introduce the activity by reviewing the fluctuation of blood pressure in the arteries during the cardiac cycle (introduced in *High Blood Pressure*). Ask such questions as:

- What happens to blood pressure when the heart beats?
- What are some approximate high and low blood pressures?
- What is the heart doing when the blood pressure is highest? Lowest?

2. Explain the principles of measuring blood pressure with a sphygmomanometer to the students.

- When the inflated cuff completely constricts (closes) the brachial artery, the blood does not flow. Thus no sound can be heard with the stethoscope.
- When the pressure in the cuff is just right (a partial constriction of the artery), the artery opens when the heart beats and closes between beats. This opening and closing of the artery is the sound heard through the stethoscope.
- When the pressure in the cuff no longer constricts the artery, the artery is wide open. The artery still expands and contracts a little, but does not close; thus no sound is heard.

3. Tell the students that they will have an opportunity to measure their own blood pressure.

Demonstrating the Procedure. Select three students to assist you in the demonstration.

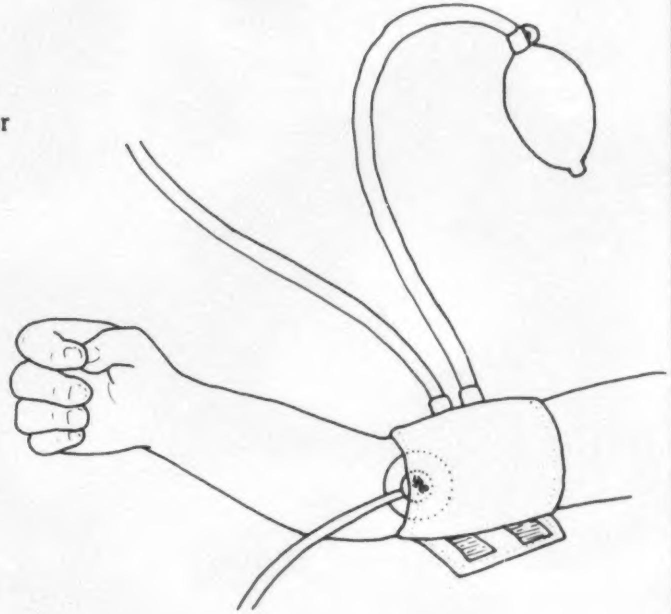
1. The team is organized as follows:

- The SUBJECT has his blood pressure measured.
- The TECHNICIAN zeroes the gauge, applies the cuff to the SUBJECT's arm, and controls the pressure in the cuff. (You should take this role during the demonstration.)
- The LISTENER listens with the stethoscope and announces when he first hears the sound of the pulse and when he stops hearing the pulse sound.

Name________________________________ Student Sheet MBP

RECORDING YOUR BLOOD PRESSURE

1. When you are the SUBJECT, sit quietly with your arm resting on a table at heart level. Your palm should be up.
2. Remind the TECHNICIAN:
    - to center the cuff logo above the inside of your elbow.
    - to zero the liquid in the gauge.
    - not to let the air out of the cuff too fast.
3. Remind the LISTENER to place the stethoscope directly under the HAP logo.
4. Tell the RECORDER to write your blood pressure values in the boxes below.
5. To determine your average blood pressure:
    - Disregard the practice-trial data.
    - Total the values for Trials 1 and 2.
    - Divide each total by 2.



BLOOD PRESSURE	**PRACTICE MEASUREMENT**	**TRIAL 1 MEASUREMENT**	**+**	**TRIAL 2 MEASUREMENT**	**=**	**TOTAL**	**÷2**	**= AVERAGE BLOOD PRESSURE**
HIGH NUMBER (SYSTOLE)			+		=		÷2	=
LOW NUMBER (DIASTOLE)			+		=		÷2	=

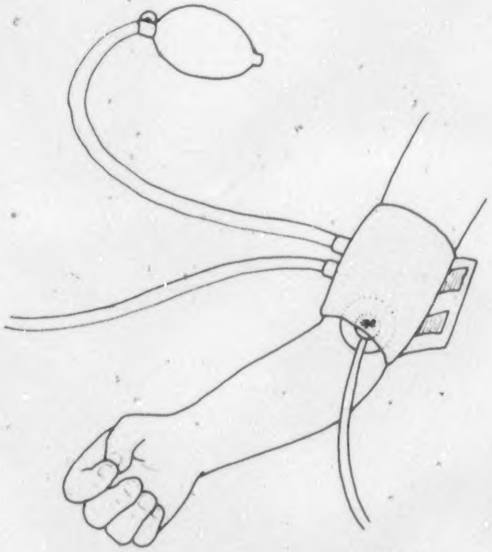
- The RECORDER reads and records the systolic and diastolic pressures.

2. Subject Preparation

- While the rest of the team gets ready to take measurements, the SUBJECT sits quietly for two minutes.
- The SUBJECT should rest his arm on a table at approximately heart level and relax. The SUBJECT's palm should be up.

3. Technician Preparation. The TECHNICIAN should:

- make sure the cuff is completely deflated and attached to the gauge.
- zero the gauge.
- position the cuff so that the HAP logo is centered above the inside of the SUBJECT's elbow. The cuff should rest on the SUBJECT's upper arm, with the lower edge of the cuff touching the inside of the elbow.
- wrap the cuff *snugly* around the arm, and press the connector strips on the cuff together.



4. Listener Preparation. The LISTENER places the stethoscope diaphragm between the cuff and the arm.

- The black surface of the stethoscope should be in contact with the skin.
- The stethoscope diaphragm should be placed beneath the HAP logo on the cuff.

5. Listener and Technician Practice. The LISTENER should practice listening for the SUBJECT's pulse through the stethoscope, while the TECHNICIAN practices slowly releasing the cuff pressure.

- The TECHNICIAN closes the valve and inflates the cuff until the liquid in the gauge rises to 100.
- The LISTENER puts on the stethoscope and listens for the sound of the pulse.
- The TECHNICIAN slowly releases the cuff pressure until the LISTENER no longer hears the pulse sound.

6. Taking the Systolic Measurement. Have your team demonstrate this measurement.

- The TECHNICIAN inflates the cuff to 160.
- The LISTENER usually does not hear the SUBJECT's pulse at 160. (If a pulse is heard, increase the cuff pressure by increments of ten until the pulse is no longer heard. ***Do not go above 200!***
- The TECHNICIAN slowly releases the pressure from the cuff (1 to 2 units per second) by opening the valve slightly.
- The RECORDER watches the level of the liquid in the gauge.
- The LISTENER listens for the sound of the pulse, and tells the RECORDER the instant she hears the pulse.
- The RECORDER notes the pressure showing on the gauge at the instant the LISTENER hears the pulse. He writes this value on the SUBJECT's Student Sheet in the "High Number (Systole)" box.

7. Taking the Diastolic Pressure Measurement.

- The TECHNICIAN continues to slowly release the pressure.
- The LISTENER continues listening and tells the RECORDER the instant she can no longer hear the pulse.
- The RECORDER notes the pressure showing on the gauge at the instant the LISTENER loses the pulse sound. He writes this value on the SUBJECT's Student Sheet in the "Low Number (Diastole)" box.
- The TECHNICIAN immediately releases all the pressure from the cuff and removes the cuff from the SUBJECT's arm.

Measuring Blood Pressure

1. Divide the class into teams of four.
2. Distribute the equipment to the groups.
   - Remind the students to disinfect the stethoscope earpieces before they use the stethoscopes.
3. Let the students measure their blood pressure.
   - Each team takes three measurements for each student (one practice and two trials).
   - The students should exchange roles until each has had a turn as the SUBJECT.
   - Allow 45 to 60 minutes for all the students to obtain their blood pressure measurements.
   - Assist when necessary.
4. Encourage the students to follow the procedure carefully. Possible sources of error include:
   - improper placement of the cuff logo on the arm.
   - improper placement of the stethoscope.
   - failure to zero the liquid in the gauge.
   - letting the air out of the cuff too fast.
   - improper position of the SUBJECT's arm. (His arm should rest on the table at heart level.)
5. The students should calculate their average blood pressure by:
   - disregarding the practice-trial data,
   - totaling the systolic pressures from both trials and the diastolic pressures from both trials, and
   - dividing each total by 2.

Analyzing the Data

1. Poll the class to determine the range of blood pressures.
2. What should a person do who reports high blood pressure?
   - Explain to the youngsters that persons whose blood pressure measures 130/95 or above should see a doctor to have their pressure checked more accurately.

HEALTH APPLICATIONS

1. Commercial sphygmomanometers are relatively inexpensive and available for private use.
   - What value could you see in obtaining one and measuring your own blood pressure?
2. What are the advantages of measuring your own family's blood pressure over going to a doctor or nurse? What are the disadvantages?

HAP SIDETRIP

Measure your blood pressure at various times during the day.

- Do your readings vary at different times?
- What kinds of things could change your blood pressure?

EXTRA WEIGHT

OVERVIEW

The students exercise both with and without weighted backpacks to discover how extra weight affects their pulse rate.

HEALTH BACKGROUND

Heart disease is the leading cause of death in the United States. One factor that contributes to heart failure is excess weight (fat). The heart must work harder (i.e., pump faster) in order to meet the strain of added weight. Also, each additional kilogram of fat that the body accumulates necessitates not only more blood but also 300 kilometers of new capillaries. So, because of excess weight, the heart must pump *faster* to pump an *increased volume* of blood a *greater distance*. On the other hand, weight gained because of muscular development does not significantly increase the effort of the heart.

In addition to putting a greater load on the heart, excess weight makes people more susceptible to high blood pressure, the common cold, dyspnea (labored breathing), bronchitis and pneumonia, postural defects, and osteoarthritis. Thus, by maintaining a normal body weight, people increase their chances of being in good health.

MATERIALS

For each student:
1 Student Sheet EW*

For the class:
32 red dots
32 green dots
8 canvas backpacks
1 clock with sweep second hand*
40 kilograms (about 40 pounds) of books*
masking tape*
1 "Extra Weight and Pulse" class chart
1 "Averaging the Data" Technique Card
duplicator master of Student Sheet EW

*Provided by the teacher.

SETTING UP

Suggested Time:

- Plan for 15 to 20 minutes for pulse-taking practice, if necessary.
- Plan for 50 to 60 minutes for the activity.

Preparing for the Activity

1. Place a five-kilogram stack of books in each backpack. (The last two columns of the illustrated chart indicate the depth of a stack of books that would weigh about five kilograms.)

If your book size is:		And the cover is:	The depth of the book stack should be:	
cm	inches		cm	inches
14 x 21	5½ x 8	Hard	12	5
		Soft	23	9
17 x 26	7 x 10	Hard	8	3
		Soft	16	6
25 x 28	9¾ x 11	Hard	6	2
		Soft	11	4

2. Set up eight side-step areas, at least one meter apart.
   - In each area, stick three 25-cm pieces of tape to the floor, parallel to each other and 130 cm apart.
3. Post the class chart.
   - Place the proper colored dots in the key on the chart. (See step 7 in the "Determining Pulse Rate" section for the proper colors.)

THE ACTIVITY

Introducing the Activity

1. Ask the students to find their pulse. If your class is not familiar with pulse taking, demonstrate this technique:
   - Arch the first three fingers of one hand and place the finger tips on your other wrist between the center of the wrist and the bone on the thumb side of the wrist.
   - Press gently so as not to cut off the pulse.
2. Work with the students until they are all able to feel their pulse.
3. Tell the students that they are going to investigate their pulse rates and one of the factors that may change those rates. Ask the students to follow this procedure:
   - Start counting when I say "START."
   - You will be counting for fifteen seconds.
   - Stop counting when I say "STOP."
   - Record this fifteen-second pulse count on your Student Sheet (item1).
   - Multiply the count by 4 to determine the number of beats per minutes (item 1).
4. Finding the Resting Pulse Rate
   - Distribute copies of the Student Sheet.
   - Lead the students in the pulse count.
5. Ask the students what might change their pulse rates.
   - If they don't mention extra weight, ask what they think would happen to their pulse if they gained five kilograms (11 pounds) of fat.
   - Tell the students to record their predictions on their Student Sheets (item 2).
6. Explain that in order to determine how extra weight affects their pulse rates, they will exercise with and without extra weight (simulating fat).

Demonstrating the Procedure

1. Demonstrate the side-step exercise.
   - Stand straddling the center tape line with your feet parallel to the tape lines.

Name____________________________ Student Sheet EW

COUNTING PULSE RATES

1. My resting pulse rate is:

Number of Beats in Fifteen Seconds	x 4	= Number of Beats Per Minute
	x 4	=

2. **PREDICTION:** If I gained five kilograms of fat, my pulse rate after exercise would (check one):

________ slow down.

________ remain the same.

________ speed up.

3. **RESULTS:**

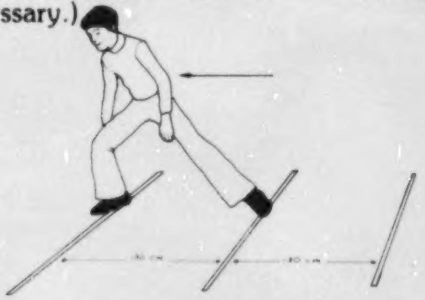
a. My pulse rate after exercise *without* extra weight is:

Number of Beats in Fifteen Seconds	x 4	= Number of Beats Per Minute
	x 4	=

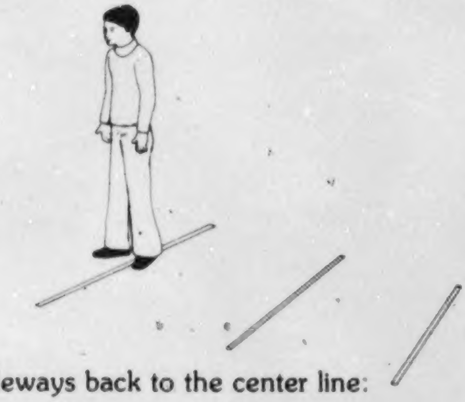
b. My pulse rate after exercise *with* extra weight is:

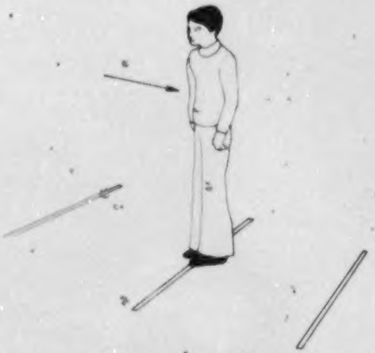
	x 4	=

- Step sideways with your right foot and touch or cross the right tape line. (Leap if necessary.)

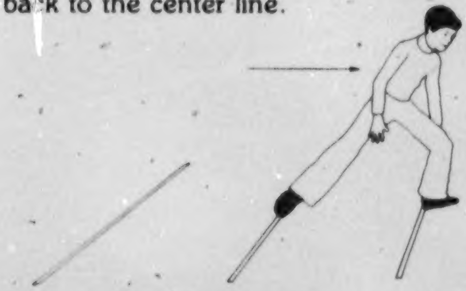


- Bring your left foot over next to your right.
- Now, leading with your left foot, step sideways back to the center line:





- Then lead with your left foot to the left tape line, and bring your right foot next to your left. Now lead with your right foot back to the center line.



2. Continue side-stepping back and forth. Tell the students to notice that you always face the same direction (feet parallel to the tape lines), and that your legs do not cross.

3. Ask one of the students to help you show the other students how to put on a backpack containing the books.

Determining After-Exercise Pulse Rates

1. Explain the data-collection procedure.
   - The students will work in pairs.
   - The members of each team take turns side-stepping for one minute and resting.
   - Immediately after each side-step period, the student who rested takes the pulse of the student who exercised while you time the pulse-taking for fifteen seconds.
   - The pulse taker then records the exerciser's pulse rate on the exerciser's Student Sheet.
   - Half the teams exercise without extra weight; the other half exercise with extra weight.

2. Divide the class into teams of two, and distribute backpacks to half the teams (one pack per team).

3. Lead the students in exercise.
   - Have one member of each with-weight team put on the backpack for the first exercise period.
   - Have the without-weight teams decide which team member will exercise first.
   - Tell the students to follow your cadence of "Right, Center, Left, Center, Right . . . ."
   - Start the one-minute exercise period.
   - Pace your cadence as rapidly as your students can follow (at least two lines per second). The cadence should be the same for all four trials.

4. As soon as the exercise period is over, say, "Find your partner's pulse."
   - Immediately begin the fifteen-second timing period. Say "START," wait fifteen seconds, and say "STOP."
   - Have the students record their pulse rates on the Student Sheets and multiply the rates by 4 (item 3).

5. The partners now exchange roles for the second exercise period.
   - Repeat steps 3 and 4.

6. Ask the teams with the backpacks to give them to the other teams for the third and fourth exercise periods.

- Repeat steps 3, 4, and 5.

7. Have each student plot his one-minute after-exercise pulse rates on the class chart. Tell the students:

- Use *green* dots for the without-extra-weight pulse rate (no backpacks).
- Use *red* dots for the with-extra-weight pulse rate.
- Place your dots as far to the left in each column as possible without overlapping.

Analyzing the Data

1. Obtain class averages for the two after-exercise pulse rates. (See the "Averaging the Data" Technique Card.)

2. Ask the students:

- What happens to your pulse rate when you exercise?
- How many of your pulse rates increased with the extra weight? How many decreased? How many stayed the same?
- What does a faster pulse rate tell you about the amount of work your heart is doing?
- What would happen to the amount of work your heart would have to do if you gained five kilograms of fat?
- If your pulse rate did not increase while you carried the extra weight, what factors may have been responsible?

HEALTH APPLICATIONS

Most of you will gain five or more kilograms because of normal body growth, and yet you may not be overweight.

- How would this normal increase in body weight differ from gaining five kilograms of fat?

HAP SIDETRIP

Repeat the activity with a different exercise. You may want to use jogging, running in place, walking, or jumping. (You will need another set of Student Sheets for each trial.)

MEASURING LUNG VOLUME

OVERVIEW

The students measure their maximum lung volumes by blowing into bags marked off in liters.

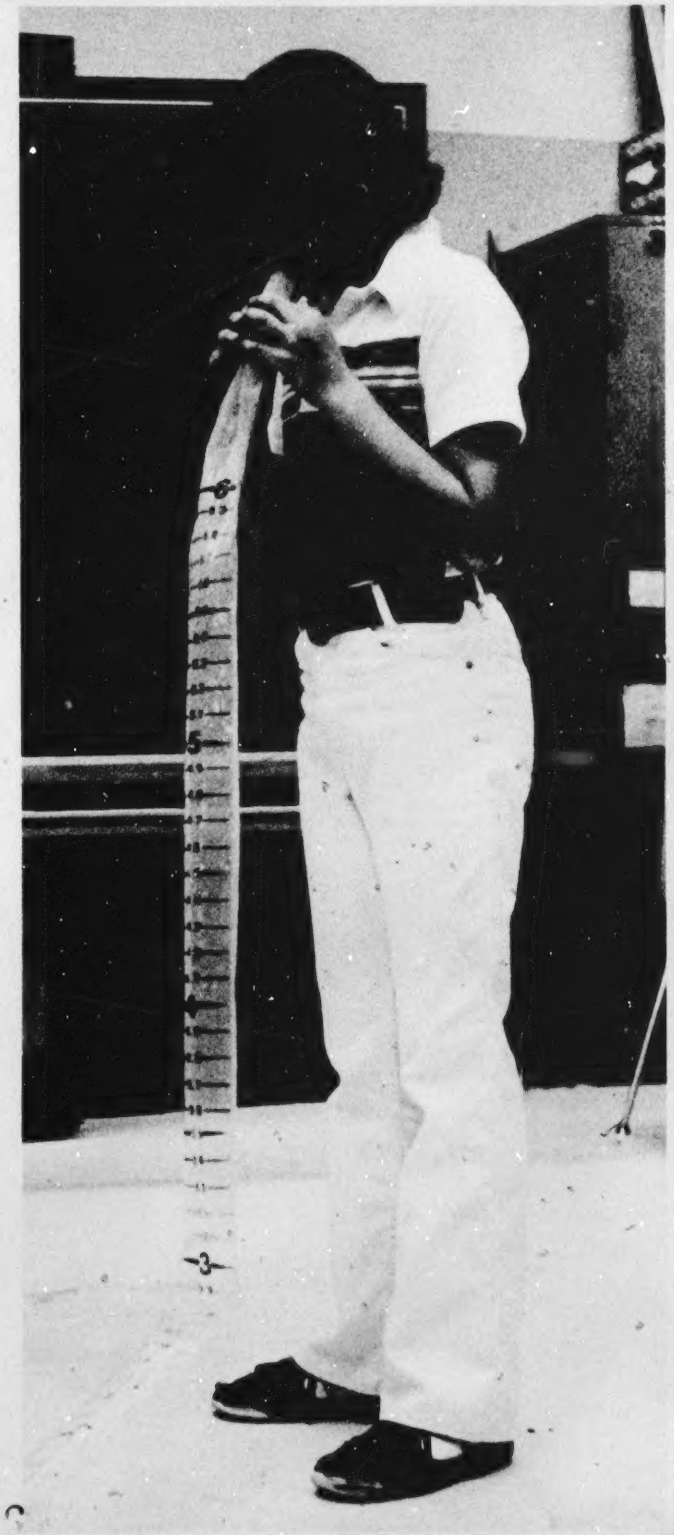
HEALTH BACKGROUND

Lung volume is a simple term for ***vital capacity,*** which is the volume of air a person can expel after taking his deepest possible breath. This volume is not really the *total* lung volume, because some air always remains in the lungs.

Lung volumes vary greatly among individuals. Factors such as sex, weight, height, inherited traits, and exercise patterns contribute to the maximum lung capacity a person can have.

Your students' lung volumes will probably vary greatly. Such factors as effort, accuracy of measurement, height, and age will affect their results. Most will have volumes between 1.5 and 5 liters. Although one might think that smokers would have lower volumes than nonsmokers, any such reduction is probably due to factors other than smoking. Smoking does not lower lung volume unless it contributes to a disease such as emphysema, which stiffens the lungs. Smoking does, however, affect normal breathing volume ***(tidal volume)*** and oxygen exchange (the topic of another HAP activity, *Measuring Breath Volume*).

Any reduction of a person's lung volume may indicate a medical problem. Emphysema, fibrosis of the lung, and asthma all reduce lung volume. Regular exercise requiring heavy breathing is one way of increasing lung volume.



MATERIALS

For each student:
1 Student Sheet MLV*

For each team of three:
1 lung volume bag
1 white coupler
3 plastic mouthpieces
1 rubber band

For the class:
1 Soaking Station (See the "Disinfecting the Equipment" Technique Card in the *What's HAPpening?* folio.)
duplicator master of Student Sheet MLV

*Provided by the teacher.

SETTING UP

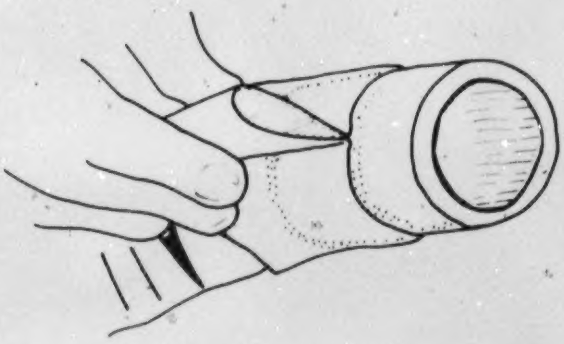
Suggested Time:

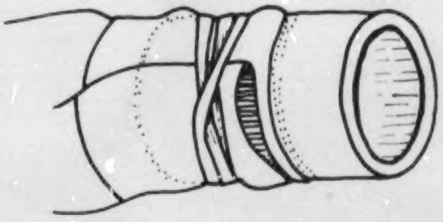
- Plan for 40 minutes for the activity.

Preparing for the Activity

1. Set up the Soaking Station as described on the "Disinfecting the Equipment" Technique Card.

2. Select a few students to use the rubber bands to attach eleven lung volume bags to the white couplers. (These couplers have a larger diameter than the mouthpieces.) Precise, neat folds around the coupler will insure the airtightness of the bags.





LOOP THE RUBBER BAND THREE TIMES

3. Duplicate the Student Sheet.

THE ACTIVITY

Introducing the Activity

1. Ask the students if they know how much air their lungs can hold.

2. Tell them that they will measure their lung volumes by blowing into bags marked off in liters. (A liter is about one quart.)

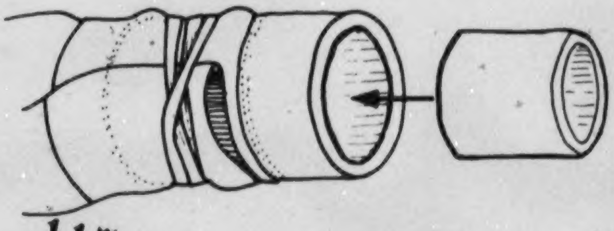
3. Ask each student to predict how many liters of air he can blow into a bag by taking his deepest possible breath and blowing it all into the bag.

4. Distribute the Student Sheets, and have the students record their predictions.

Demonstrating the Use of the Lung Volume Bags

1. Select one student to be the SUBJECT, one to be the RECORDER, and you assume the role of MEASURER.

2. Insert a mouthpiece into a coupler connected to a bag.



Name______________________________ Student Sheet MLV

MEASURING YOUR LUNG VOLUME

1. **Predicting.** I predict that I can blow __________ liters of air with one breath into the bag.
2. **Practicing**
   - Stand up, and blow all the air you can with one breath into the bag.
   - The MEASURER wraps the bag tightly around her hand until the bag is stiff.
   - The RECORDER reads your volume off the bag.
3. **Measuring.** Measure your lung volume.
   - Take three more trials.
   - Have the RECORDER record the three volumes in the table below.
   - Total the three trials.
   - Divide the total by three to find your averge lung volume.

TRIAL NUMBER	**VOLUME**			**AVERAGE LUNG VOLUME**
ONE	________ liters			
TWO	________ liters			
THREE	________ liters			
TOTAL	________ liters	÷ 3	=	________ liters

4. Record your average lung volume on the chalkboard.

HEALTH ACTIVITIES PROJECT

3. Make sure the bag is empty by flattening it against your thigh.

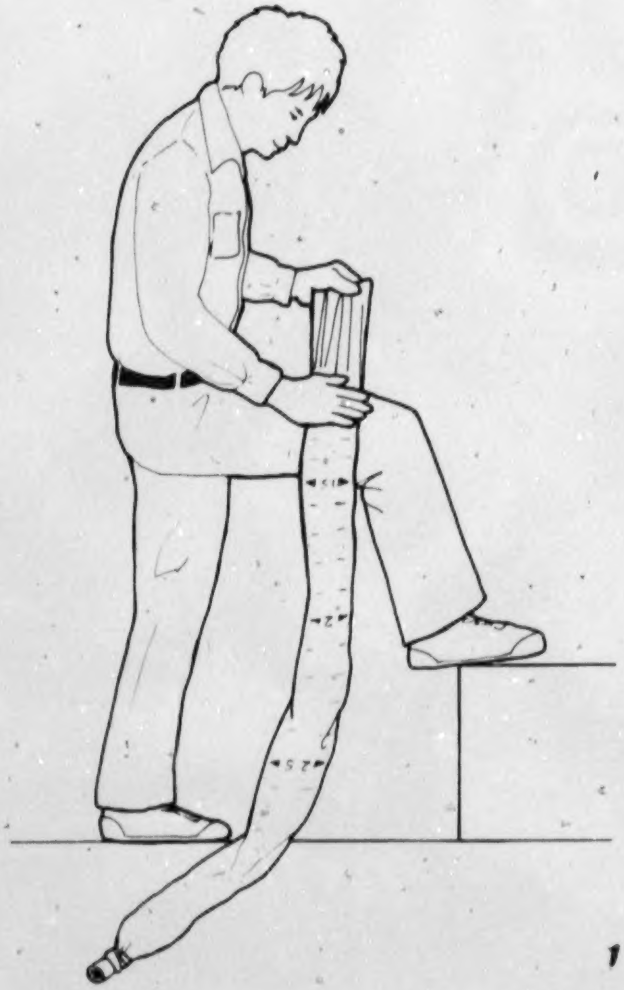
4. Ask the SUBJECT to take his deepest possible breath and blow all of it into the bag.

- As soon as the SUBJECT has finished expelling his air, grasp the bag just below the coupler and twist it to trap the air.
- Wrap the bag tightly around your fist until the bag becomes stiff.

5. Ask the RECORDER to read the volume from the scale on the bag and to record this value on the chalkboard.

- Other students can verify the quantity of air in the bag.

6. Show the students how to empty the bag as shown in the illustration.



7. Discuss with the students the differences in results that might arise:

- if the bag were not empty at the start.
- if two breaths were blown into the bag.
- if the bag were not wrapped snugly around the fist.

8. Ask the SUBJECT to complete two more trials and the recorder to record these volumes on the chalkboard.

- Help the SUBJECT average the three values and have him circle the average.
- Explain that each pupil will write his average on the chalkboard after he has completed his trials.

9. You can help avert unwanted competition by:

- *not* blowing into the bag yourself (even during the demonstration).
- *not* giving special attention or approval to students with exceptionally large lung volumes.

Measuring Lung Volume

1. Explain the procedure. Each student:

- takes one practice trial.
- breathes into the bag three times and has his three lung volume values recorded.
- averages his results on his Student Sheet.
- writes his average on the chalkboard.
- acts as MEASURER and RECORDER for his partners.

2. Tell the students that each of them will have their own mouthpiece and that they should not use any others.

3. Form teams of three students, have them get their materials, and let them start their trials.

- Assist those having trouble.

Analyzing the Results

1. Point out the many different volumes on the chalkboard, mentioning the *variation*.

2. Ask the students:

- Since you are all about the same age, why do you suppose your lung volumes vary so much? (Encourage the students to offer as many reasons as they can and to discuss each one.)
- Lungs are nearly always large enough for the people who own them, if they take care of them. Do you know of anything that could change your lung volume?

Cleanup. Ask the students to wash, rinse, and disinfect their mouthpieces as described on the "Disinfecting the Equipment" Technique Card.

HEALTH APPLICATIONS

Assuming that lung volume bags were available for people to buy and have for their own, how could you use one to monitor your health?

HAP SIDETRIPS

1. Does running change your lung volume? Measure your lung volume before and immediately after running.

2. Does your body position affect your lung volume? Measure your lung volume while you stand, sit, and lie face down.

3. Does breathing hot or cold air change your lung volume? Measure your lung volume outside on a very cold day, and compare it to your lung volume measured in the classroom.

Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

Supported by a grant
from the Robert Wood Johnson
Foundation to the Association of
Science-Technology Centers.

MEASURING BREATH VOLUME

OVERVIEW

The students discover how exercise affects their breath volumes and breathing rates by taking *at rest* and *after exercise* measurements.

HEALTH BACKGROUND

At rest, people breathe (respire) about one-half liter of air with each breath. This single-breath volume, called ***tidal volume,*** is about one-eighth to one-fourth of an individual's total lung volume, called ***vital capacity.*** A person can calculate the amount of air he breathes in one minute ***(respiratory minute volume*** or ***RMV)*** by multiplying his single-breath volume by his breathing rate. Most people have a resting RMV in the range of five to ten liters. During heavy exercise, the RMV may increase to four to eight times the resting RMV.

Various factors affect breathing efficiency. Physical fitness contributes to efficient breathing. Physically active indivduals tend to have larger lung volumes, and thus larger lung reserves for doing physical work than sedentary individuals have. Besides having more reserves, active people also use less air to perform a given task.

Emphysema and chronic bronchitis impair breathing efficiency by narrowing the lungs' airways and by destroying the alveolar tissue. These diseases are among our nation's most rapidly growing health problems. Cigarette smoking has been identified as the major risk factor associated with these diseases.

MATERIALS

For each student:
1 Student Sheet MBV*

For each team of three students:
1 Breath Apparatus
3 narrow mouthpieces

For the class:
1 Soaking Station (See the "Disinfecting the Equipment" Technique Card in the *What's HAPpening?* folio.)
70 blue dots
70 red dots
32 drinking straws (optional for HAP Sidetrip)
1 wrist watch with a second hand*
1 clock*
1 marking pen*
1 "Breath Volume *At Rest* and *After Exercise*" chart
1 "Breathing Rate *At Rest* and *After Exercise*" chart
1 "Averaging the Data" Technique Card (from the *What's HAPening?* folio)
1 "Breath Apparatus" Equipment Card
1 "Making Breath Measurements" Procedure Card
duplicator master of Student Sheet MBV

*Provided by the teacher.

SETTING UP

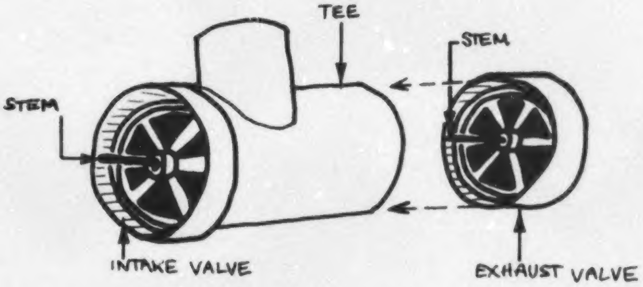
Suggested Time: Conduct *Measuring Lung Volume* before presenting this activity.

- Plan for 40 to 60 minutes for Part One.
- Plan for 40 to 60 minutes for Part Two.

Preparing for Part One

1. Make sure the mouthpieces, valve systems, and couplers have been disinfected according to the directions on the "Disinfecting the Equipment" Technique Card.

2. Assemble the valve system as shown. When correctly assembled, a rubber stem sticks out from one end only.



3. Post the class charts, and place the dots nearby. Put a blue dot and a red dot on the Key where indicated.

4. Read the Procedure Card to familiarize yourself with the trial procedures.

5. Duplicate the Student Sheet.

Preparing for Part Two

1. Disinfect the valve systems, mouthpieces, and couplers.

2. Reassemble the valve systems.

3. On the chalkboard, draw the graph illustrated in this folio, but *without the plotted example*.

4. Select a running site.

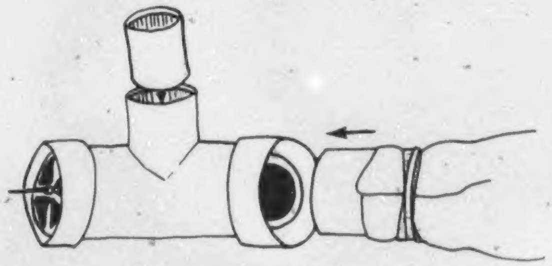
5. Optional. Obtain free material on respiratory diseases and smoking from your local chapter of the Lung Association or Cancer Society.

THE ACTIVITY: PART ONE

Introducing the Activity. Tell the students that in this activity they will measure how fast they breathe and how much air they exhale *at rest* (while sitting) and *after exercise*.

Demonstrating the Equipment

1. Show the students how to assemble the equipment. (See the Equipment Card.)



Name________________________________ Student Sheet MBV

MAKING BREATH MEASUREMENTS

PART ONE: BREATHING *AT REST*

1. Breath Volume

- Sit quietly for one minute before starting.
- Breathe four times into the equipment for *each trial.*

Trial 1 __________ liters

Trial 2 __________ liters

Trial 3 __________ liters

- Cross out the high and low values, and *circle* the remaining value.

2. Breathing Rate

- While sitting, have the COUNTER count the number of breaths you take in one minute.

You take __________ breaths in one minute

- With blue dots, plot the two circled values in the "At Rest" columns of the class charts.

PART TWO: BREATHING *AFTER EXERCISE*

1. Breath Volume

- After running, immediately breathe *two times* into the equipment.

VOLUME OF TWO BREATHS AFTER RUNNING	x 2	= VOLUME OF FOUR BREATHS AFTER RUNNING
____________________ liters	x 2	= ____________________ liters

2. Breathing Rate

- Have the COUNTER count your breaths for fifteen seconds.

NUMBER OF BREATHS IN FIFTEEN SECONDS	x 4	= BREATHING RATE (BREATHS PER MINUTE)
____________________ breaths	x 4	= ______________ breaths per minute

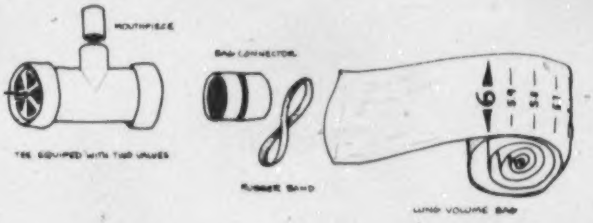
- With red dots, plot your breath volume and breathing rate in the "After Exercise" columns of the class charts.

Measuring Breath Volume
Equipment Card

BREATH APPARATUS

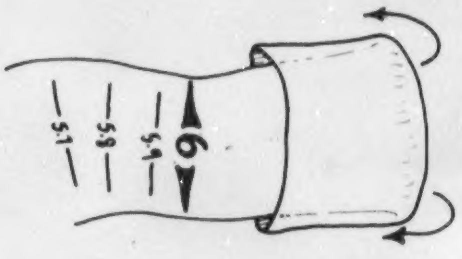
MATERIALS FOR ONE BREATH APPARATUS:

1 tee equipped with two valves
1 mouthpiece
1 white coupler with red ring
1 rubber band
1 lung volume bag

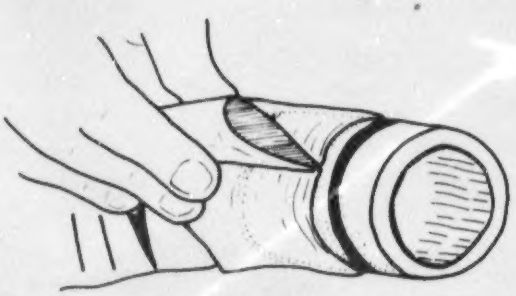


ASSEMBLING THE APPARATUS

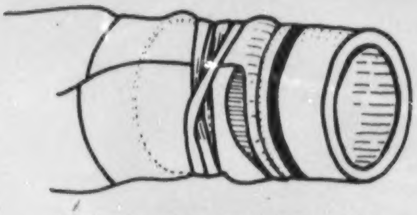
1. Turn the open end of the bag inside out, making a "cuff" about two inches wide.



2. Insert half of the coupler into the bag opening, and fold the bag tightly around the coupler.



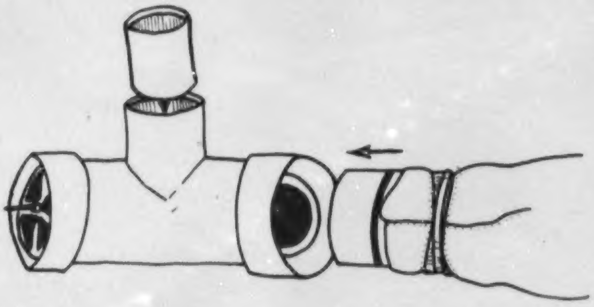
3. Fold the resulting flap against the coupler, and secure the bag to the coupler by triple-looping a rubber band around the outside.



LOOP THE RUBBER BAND THREE TIMES

4. Insert the coupler with the bag attached into the exhaust end (side with the flat rubber disk showing) of the valve system.

5. Insert the mouthpiece into the stem of the tee.



EMPTYING THE BAG

1. Pull the coupler with the attached bag out of the exhaust valve.

2. Lay the closed end of the bag on your thigh, and press your hand firmly on the bag at the closed end.

3. Now with your other hand, grasp the closed end of the bag and pull it along between your hand and thigh to press out the air.

Measuring Breath Volume
Procedure Card

MAKING BREATH MEASUREMENTS

TEAM ROLES

Each team has three roles:

1. The BREATHER breathes into the equipment.

2. The COUNTER prepares the equipment for each trial and counts the BREATHER's breaths.

3. The RECORDER acts as the *at rest* timer, measures the breath volumes, and records the data.

AT REST TRIAL PROCEDURES

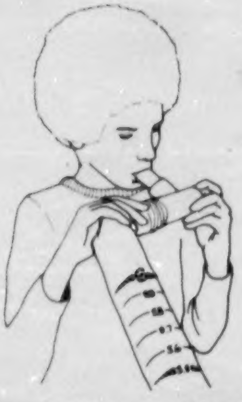
Measuring Breath Volume

1. The BREATHER must sit for at least one minute before starting the breath trials.

- Note: When a person is *at rest*, only a slight up-and-down movement of the chest should be evident. Remind the students that they are measuring their breathing *at rest* and they should not breathe any deeper or faster than they normally do when sitting.

2. The COUNTER empties the bag, assembles the equipment, and gives it to the BREATHER.

3. The BREATHER inserts his mouthpiece into the valve assembly and holds the apparatus near his mouth while the COUNTER straightens out the bag.

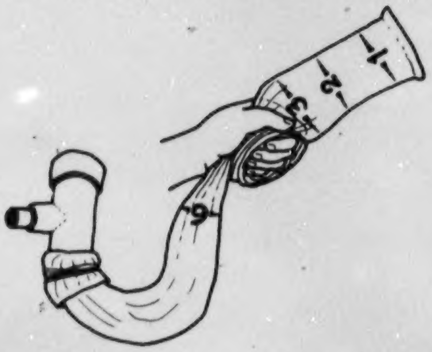


4. The BREATHER seals his mouth *around* the mouthpiece and inhales and exhales four times *through his mouth only*.

- The BREATHERS should keep their mouths sealed around the mouthpiece until they complete their four breaths (i.e., they should not remove the mouthpiece between breaths).

5. As soon as the BREATHER has finished his four breaths, the RECORDER:

- grasps the bag just below the bag coupler and twists the bag to trap the air.
- wraps the bag tightly around her fist until the bag becomes stiff.
- records the volume of air in the bag on the BREATHER's Student Sheet.



6. Repeat steps 1 through 5 two times to make a total of three measurements.

Measuring Breathing Rate

After the BREATHER's breath volume has been measured, he has his breathing rate measured.

1. The RECORDER conducts a one-minute timing session. Watching the clock, he says "START."

2. The COUNTER immediately starts counting the BREATHER's breaths (i.e., the number of times the chest rises).

3. The RECORDER says "STOP" when one minute has elapsed, and then records how many breaths the BREATHER took.

4. Notes to the teacher:

- Some people breathe so lightly that their chest movements are difficult to see. Let light-breathing students count their own breaths.
- Students who count more than thirty breaths are counting both inhalations and exhalations, counting inaccurately, or have excessively high breathing rates. Find out what the problem is and assist the students.

Switching Roles

The team members trade roles and repeat both breath measurement procedures.

AFTER EXERCISE TRIAL PROCEDURES

This time the BREATHERS use the breath equipment after running for about two minutes. The teams follow the *At Rest* Trial Procedures with the following changes:

Measuring Breath Volume

1. Within five seconds after running, the BREATHER breathes *two times* into the bag. (Four *after exercise* breaths may exceed the capacity of the bag, six liters.)

2. Each student completes only *one* measurement instead of three.

Measuring Breathing Rate

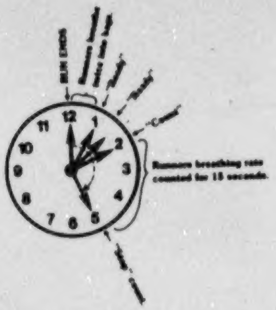
1. The COUNTER counts breaths for only fifteen seconds. During the five seconds in which the BREATHERS blow into the bag, call out two warning signals (e.g. "Ready . . . Ready . . .).

2. Looking at the watch with a second hand, say "START."

3. The COUNTERS immediately start counting the BREATHERS' breaths.

4. After fifteen seconds, call "STOP."

5. The RECORDERS should write the number of breaths in the space labeled "Number of Breaths in Fifteen Seconds." A sample timing scheme is illustrated.



6. While the COUNTER is counting the breaths, the RECORDER should read the volume off the bag from the BREATHER's two breaths, and record the volume on the Student Sheet.

2. Caution the students to keep the lung volume bags off the ground to avoid puncturing the bags.

3. Explain the *At Rest* Trial Procedures. (See the Procedure Card.)

Breathing *At Rest*

1. Remind each BREATHER to complete three trials before switching roles with his teammates. Everyone should remain seated during the *at rest* trials.

2. Distribute the Student Sheets, and go over Part One of the sheets with the students.
- Tell them to ignore Part Two for now.

3. Give each team one Breath Apparatus and three mouthpieces.

4. Have the teams find their *at rest* breath volumes and breathing rates.

5. When they finish, ask each of the teams to use *blue* dots to plot their data in the "At Rest" columns on the class charts.

6. Collect all the equipment.

Analyzing the Data

1. What was the class range (i.e., the lowest and the highest values) in breath volumes and breathing rates?

2. Obtain a class average for both breath volume and breathing rate. (See the "Averaging the Data" Technique Card.)
- Mark the average points with an X.

3. Collect the Student Sheets, and save them for Part Two.

THE ACTIVITY: PART TWO

Introducing Part Two

1. Announce to the students that now they are going to measure their *after exercise* breath volumes and breathing rates.
- What do you think exercise will do to your breath volume and breathing rate?

2. Describe the *At Rest* Trial Procedures for the class. (See the Procedure Card.)

3. Return the Student Sheets, and go over Part Two of the sheets with the students.

Breathing *After Exercise*

1. Take the class to the running site. Ask the students to bring their Student Sheets and pencils with them.

2. Choose a PACER to run at a medium pace (brisk jog) that everyone can maintain.
- *No one should pass the PACER.*
- One member of each team runs at a time. The remaining team members act as RECORDER and COUNTER.

3. Distribute the equipment and ask the teams to get ready to record at the finish area.
- Tell the RECORDERS and COUNTERS that they will make the breath measurements immediately after the run.

4. Let the run begin. Make sure the group runs for at least two minutes. (Note: If you have to substitute another exercise, make sure it is strenuous enough to produce heavy breathing.)

5. Repeat the run and *after exercise* breath measurements until all the students' measurements have been taken. Have a different PACER lead each run.

6. Return to the classroom to compute the values that the students will plot on the charts. (See the Student Sheet.)
- Ask the students to use *red* dots to plot their data in the "After Exercise" columns on the class charts.

7. Collect all the equipment.

Analyzing the Data

1. What was the class range in *after exercise* breath volumes and breathing rates?

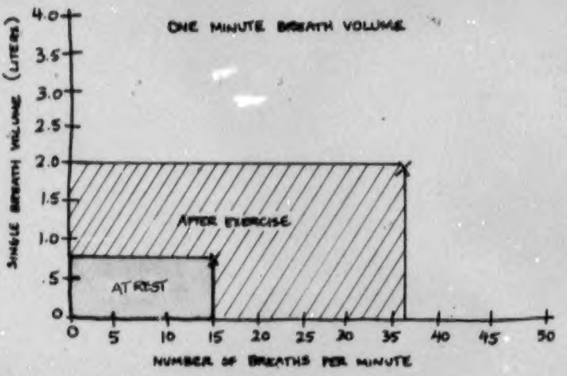
2. Average the *after exercise* data. (See the "Averaging the Data" Technique Card.)
- Draw a line between the *at rest* and *after exercise* average points.
- What effect did exercise have on the average breath volume and breathing rate for the class?

CLASS AVERAGE:

	BREATHING RATE	4-BREATH VOLUME	SINGLE BREATH VOLUME
AT REST:	15 BREATH /MIN.	3 LITERS ÷ 4 =	3/4 LITER
AFTER EXERCISE:	36 BREATH/MIN	8 LITERS ÷ 4 =	2 LITER

3. Using the Chalkboard Graph. Divide the average breath volumes by four to get average single-breath volumes. Plot the average *at rest* and *after exercise* data on the chalkboard graph.

- Connect the plotted points to the vertical and horizontal axes to make two rectangles. Shade in the rectangles to make them stand out. (See the example in the illustrated graph.)



4. Explain that the rectangles represent the class averages for the amounts of air that each of the students breathe in one minute *at rest* and *after exercise*.

- How much more air do we use while exercising than when we are at rest?

Cleanup. Disinfect the equipment, dry it, and store it in plastic bags.

HEALTH APPLICATIONS

You go outdoors to exercise and discover that it is very smoggy. What would you do? Why?

HAP SIDETRIPS

1. Distribute the straws, and challenge each student to breathe through a straw while at rest. Then challenge the students to breathe through the straws while they run in place for twenty seconds.

- Caution the students not to breathe through the straw for more than thirty seconds. (Carbon dioxide buildup might occur with resulting dizziness and headache.)
- What did breathing through the straw feel like? How do you think it would affect your ability to run a 100-meter dash?
- Explain that breathing through the straw simulates what having a respiratory disease such as chronic bronchitis is like. This disease narrows the airways (bronchi) in the lungs and increases breathing resistance.
- At this time, you may want to initiate a discussion on the effects of cigarette smoking and the relationship between smoking and respiratory diseases such as chronic bronchitis and emphysema.

2. Help the students compute their individual one-minute breath volumes (RMV's) *at rest* and *after exercise*.

3. Measure the RMV of smokers (smoked at least five years) and non-smokers *at rest* and *after exercise*.

Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

Supported by a grant
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GAS EXCHANGE

OVERVIEW

The students measure amounts of carbon dioxide in the air they exhale *while at rest* and *after exercise*.

HEALTH BACKGROUND

Body cells use *oxygen* to carry on their life functions and produce *carbon dioxide* as a waste product. Hemoglobin in the red blood cells is the primary carrier for these two gases, although some carbon dioxide is carried in the blood plasma. The blood transports the carbon dioxide to the lungs, where it is released. In the lungs, the blood absorbs oxygen for the body cells. This process of gas exchange in the lungs and body cells is called ***respiration.***

The regulation of gas exchange in the lungs is precisely controlled. As cellular activity (metabolism) increases, the cells produce more carbon dioxide, which is absorbed by the blood. This increased carbon dioxide level triggers a complex nerve process, which increases the breathing rate. The amounts of carbon dioxide and oxygen in each lungful of air we exhale remain relatively constant whether we are exercising or resting. The way we reduce excess carbon dioxide levels is to increase our breathing rate.

MATERIALS

For each team of three:
1 two-liter air bag
1 white coupler
3 mouthpieces
1 rubber band
1 two-ounce dropper bottle of dilute ammonia
4 nine-ounce clear plastic cups
1 plastic stirrer
1 sheet of white paper*
1 Student Sheet GE*

For the class:
1 Soaking Station (See the "Disinfecting the Equipment" Technique Card in the *What's HAPpening?* folio.)
1 three-gallon bucket
1 half-ounce dropper bottle of bromothymol blue (BTB) concentrate
2 five-ounce paper cups for measuring
4 gallons of water* (See "Preparing for the Activity.")
paper towels*
paper and pencils*
duplicator master of Student Sheet GE

*Provided by the teacher.

SETTING UP

Suggested Time: Conduct *Measuring Breath Volume* before presenting this activity.

- Plan for 45 to 60 minutes for Part One.
- Plan for 45 to 60 minutes for Part Two.

Preparing for the Activity

1. Set up the Soaking Station as described on the Technique Card. Disinfect the mouthpieces before each part of the activity.

2. Before the first session, test your tap water for acidity.

- Add three drops of BTB concentrate to half a cup of tap water, and stir.
- The solution should be blue. If not, obtain four gallons of distilled water to use in the activity.

3. Prepare the stock BTB solution.

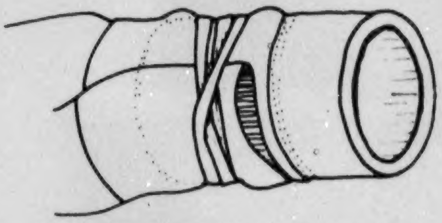
- Allow eight liters (about two gallons) of water to sit in the bucket for at least four hours. (The water should be at room temperature for use in the activity.)
- Add 80 drops of BTB concentrate to the water, and stir.
- The solution should be blue.

4. Assign two students to use the five-ounce paper cups to measure five ounces of stock BTB solution into each of the *plastic* cups.

Note: Steps 3 and 4 above must be repeated before you conduct Part Two.

5. Set up two equipment stations containing the cups of BTB and the remainder of the materials.

- Attach a white coupler to each two-liter bag with a rubber band, as illustrated.



LOOP THE RUBBER BAND THREE TIMES

THE ACTIVITY: PART ONE

Introducing the Activity

1. Explain to the students that the body uses oxygen from inhaled air and produces carbon dioxide, which is exhaled.

2. Tell the students that you have a method to determine the amount of carbon dioxide in their exhaled breath.

MEASURING CARBON DIOXIDE LEVELS

Materials for your team:
1 two-liter air bag with a white coupler
3 mouthpieces
1 two-ounce dropper bottle of dilute ammonia
1 plastic stirrer
1 sheet of white paper
4 cups of blue BTB solution

Finding Your Carbon Dioxide Level

1. Pour one cup of blue BTB solution into the air bag.
2. Remove the air from the bag by flattening the bag against your thigh. Be careful not to lose any of the BTB solution.
3. Fill the bag by blowing air from your lungs into the bag, and close off the top of the bag by twisting the mouthpiece.
4. Shake the BTB solution in the bag vigorously thirty times.
5. Pour the *yellow* BTB solution from the bag back into the plastic cup.
6. Place the cup next to the *blue* BTB standard cup on a sheet of paper.
7. Add ammonia from the dropper bottle *one drop at a time* and *count the drops*. Stir the solution *once* after each drop.
8. Look down on the cups to compare the colors of the standard cup and your test cup.
9. Once the BTB remains blue for thirty seconds, record the number of drops in the proper box below.

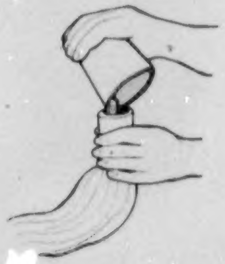
NAME	**NUMBER OF DROPS *AT REST***	**NUMBER OF DROPS *AFTER EXERCISE***

EACH STUDENT: CIRCLE THE LARGER NUMBER FROM YOUR TWO TRIALS.

Demonstrating the Activity

1. First, demonstrate the effect of room air on the BTB solution.

- Pour one of the cups of blue BTB solution through the coupler into an empty two-liter air bag.



- Fill the bag with room air by separating the sides of the bag as much as possible. (Do not breathe into the bag.)
- Twist the top of the bag closed, and shake the BTB solution in the bag vigorously thirty times.
- The BTB solution should not change color.

2. Now, demonstrate the effect of exhaled air on the BTB solution.

- Remove the air from the bag by flattening the bag on a table. Be careful not to lose any BTB solution.
- Insert a mouthpiece into the coupler.
- Fill the bag by blowing air from your lungs into the bag, and close off the top of the bag by twisting the coupler.
- Shake the BTB solution in the bag vigorously thirty times.
- The BTB should change from blue to yellow.
- Tell the students that the BTB solution changes because it absorbs the carbon dioxide from your breath.

3. Show the students how to determine the amount of carbon dioxide in the BTB solution.

- Remove the mouthpiece from the coupler.
- Pour the *yellow* BTB solution from the bag back into the empty plastic cup.
- Place the cup next to a cup of *blue* BTB solution on a sheet of white paper.
- Explain that the cup of unused, *blue* BTB solution is to be used as a standard for color comparison.
- Tell the students that as they work, they should look down on the cups to compare colors.
- Add ammonia from the dispensing bottle *one drop at a time* and *count* the drops *out loud*. (The students can do their counting to themselves; this is merely to demonstrate the procedure.)
- Gently stir the solution *once* after each drop. Explain that too much stirring allows carbon dioxide to escape into the air.
- Add *single drops* of ammonia until the BTB solution stays the same color as the standard for at least *thirty seconds*.
- Once the BTB remains blue for thirty seconds, STOP. Explain to the students that they will record the number of drops they used.

4. Discard your used BTB solution.

5. Caution the students that they will be working with chemicals; no clowning around!

- BTB can stain clothing.
- Ammonia can damage the eyes.

Measuring Carbon Dioxide Levels *At Rest*

1. Give each team of three a Student Sheet, and tell them to look at the "Materials" section.

2. Let the students pick up their equipment from the distribution stations.

- Two team members should *each* get two cups of blue BTB solution.
- The third team member should get the remainder of the equipment.

3. Challenge the students to obtain their carbon dioxide levels *at rest.* Make sure the students:

- record the number of drops of ammonia they each use.
- discard their used BTB solutions.

4. Allow enough time for all three team members to find their carbon dioxide levels.

THE ACTIVITY: PART TWO

Introducing Part Two

1. Ask the students what they think happens to the amount of carbon dioxide they produce after exercise.

2. Tell them that they can test their prediction by using the same procedure following an exercise period.

Measuring Carbon Dioxide Levels *After Exercise*

1. Explain the procedure to the students.
- You or a student will lead one student from each team in fifty Jumping Jacks in 50 seconds.
- Immediately after exercising, the exerciser measures her carbon dioxide level and records her *after exercise* carbon dioxide level on the Student Sheet in the appropriate place.

2. Lead three exercise periods, so that all three team members find their carbon dioxide levels.

Analyzing the Data

1. What does the number of drops of ammonia represent? (The amount of carbon dioxide.)

2. Poll the students to determine what they have discovered about the effect of exercise on the amount of carbon dioxide in their exhaled air.
- Ask each student to circle the larger number of ammonia drops she recorded from her two trials on her Student Sheet.
- On the chalkboard, record the number of students whose larger number is in the "At Rest" column.
- Record the number of students whose larger number is in the "After Exercise" column.
- The numbers in the columns should be about the same. Compare the two columns with the class, pointing out how the results are "about the same."

3. Ask the students to describe their individual results. (The carbon dioxide levels should be about the same for both *at rest* and *after exercise* trials.)
- How does this information relate to their predictions?
- Do they still think that the body produces more carbon dioxide?

4. Review with the students their breathing-rate data from *Measuring Breath Volume*. (Post the "Breathing Rate *At Rest* and *After Exercise*" chart if available.) Review the at-rest and after-exercise breathing rates.

5. Key Question. Ask the students:
- If you breathe *faster* and the amount of carbon dioxide expelled in any one breath is basically the same, what could you say about the total amount of carbon dioxide you expell in a minute after exercising as compared to a minute at rest?

HEALTH APPLICATIONS

Suppose you (or a friend) noticed that you were breathing faster than you usually do.
- What might this tell you about your body?
- How could you determine if you were really breathing faster than normal for you?

HAP SIDETRIPS

1. Find out how breathing into and out of a paper lunch bag ten times (inhalation plus exhalation equals one breath) affects the carbon dioxide level in your exhaled air.

2. Find out how holding your breath affects your carbon dioxide level.

FALLOUT

OVERVIEW

The students simulate the body's air-quality control system, and investigate the dust and dirt in the air.

HEALTH BACKGROUND

The body is equipped with its own air-quality control system, which cleans, moistens, and warms inhaled air. The openings of the nose contain crisscross hairs that filter dust and other particles. The nasal passages and lung airways are lined with mucus and tiny waving hairs called ***cilia***. The wet, sticky mucus traps dirt and germs that get past the nostrils, while the moist cilia pass the dirt- and germ-laden mucus back to the throat to be swallowed. It is finally eliminated through the intestinal tract.

Several factors can affect the efficiency of the body's air-quality control system. Very dusty or smoky air can, when inhaled, clog the airways faster than they can be cleaned. Inhaled pollutants, such as cigarette smoke, can paralyze or destroy the cilia, which normally clean the passages. Habitual mouth-breathing bypasses a large part of the body's air-quality control system, thus overworking and drying out the layer of mucus in the lung airways. All of these conditions can increase a person's susceptibility to respiratory ailments by allowing inhaled pollutants to reach the lungs.

MATERIALS

For each student:
1 plastic tape-transfer sheet
1 5" x 8" index card
1 sealable plastic bag
1 Secret Observation Card*
1 Face Mask Record Card*

For the class:
34 particle masks
16 sheets of mirrored plastic
4 rolls of transparent double-stick tape
4 rolls of regular transparent tape*
4 metric rulers*
1 "Secret Observation Cards" duplicator master
1 "Face Mask Record Cards" duplicator master
*Provided by the teacher.

SETTING UP

Suggested Time:

- Plan for 60 minutes for Part One.
- Plan for 30 minutes at least four days later for Part Two.

Preparing for the Activity

1. Duplicate the Secret Observation Cards and the Face Mask Record Cards. Cut them apart.

2. Divide the following materials equally among three distribution stations. (Keep two particle masks: one to store as a "control" mask, and one for yourself.)

- Particle masks
- Index cards
- Sealable plastic bags
- Face Mask Record Cards

THE ACTIVITY: PART ONE

Introducing the Activity. Tell the class that they will be making secret observations. Do not tell them anything else. In this way, the observations will more accurately reflect the students' normal breathing patterns.

Making Secret Observations

1. Divide the class into two equal groups.

- Tell one group (the SUBJECTS) to leave the room and to wait quietly outside the door until you call them back.
- Tell those remaining that they will act as OBSERVERS.

2. Give each OBSERVER one Secret Observation Card and one mirrored plastic sheet. Outline the observation procedure:

- When the SUBJECTS have returned and are seated, select one of the seated students to be your SUBJECT. Each of you should choose a different student to observe.
- Write your SUBJECT's name on your card.
- Determine whether your SUBJECT's mouth is open or closed. Check the appropriate box on your card.

- Hold a mirrored plastic sheet above your SUBJECT's mouth, but under his nose. Try not to touch the SUBJECT. Does the strip fog? Check the appropriate box on your card. (Note to the teacher: You might want to demonstrate the fogging by holding the plastic sheet under your nose. Bend your head forward and down slightly so that the students can see.)
- Keep your cards and plastic sheets hidden as the SUBJECTS return to the room.

3. Collecting the Data

- Call the SUBJECTS in.
- Tell them to find seats and to sit down quietly.
- Ask the SUBJECTS to close their eyes and to keep them closed.
- Ask the OBSERVERS to collect their data.

4. After all the observations have been made, collect the materials and then ask the SUBJECTS to open their eyes.

5. Repeat the process.

- Tell the OBSERVERS that now they will be SUBJECTS in another test.
- *Do not let on that both sets of observations are the same!*
- Ask the new SUBJECTS to leave the room.
- Repeat steps 2 and 3 with the new OBSERVERS.

Fallout

FACE MASK RECORD CARDS

Fallout **FACE MASK RECORD CARD**

Name ______________________________

HOW LONG DID YOU WEAR THE MASK?	WHERE WERE YOU?	WHAT WERE YOU DOING?
EXAMPLE: 40 minutes	ballfield	playing baseball
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Fallout **FACE MASK RECORD CARD**

Name ______________________________

HOW LONG DID YOU WEAR THE MASK?	WHERE WERE YOU?	WHAT WERE YOU DOING?
EXAMPLE: 40 minutes	ballfield	playing baseball
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Fallout

SECRET OBSERVATION CARDS

Fallout **SECRET OBSERVATION CARD**

Name of person you are observing:

Mouth is: ☐ Open ☐ Closed

Does the mirrored plastic sheet fog when placed under the nose? ☐ Yes ☐ No

---

Fallout **SECRET OBSERVATION CARD**

Name of person you are observing:

Mouth is: ☐ Open ☐ Closed

Does the mirrored plastic sheet fog when placed under the nose? ☐ Yes ☐ No

---

Fallout **SECRET OBSERVATION CARD**

Name of person you are observing:

Mouth is: ☐ Open ☐ Closed

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Name of person you are observing:

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Does the mirrored plastic sheet fog when placed under the nose? ☐ Yes ☐ No

---

Fallout **SECRET OBSERVATION CARD**

Name of person you are observing:

Mouth is: ☐ Open ☐ Closed

Does the mirrored plastic sheet fog when placed under the nose? ☐ Yes ☐ No

6. After all the observations have been made and you have collected all the materials, announce that each group actually made the same observations. (Save the Secret Observation Cards for Part Two of the activity.)

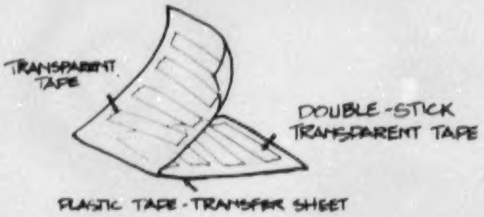
- Tell the students that fogging of the mirrored plastic strips held under the nose indicates that the person is a nose-breather.
- Ask the students if they think air pollution would have a different effect on nose-breathers than on mouth-breathers.
- Ask if they believe that the air they breathe is polluted. Why?

7. Tell the students that they are now going to discover how dirty the air is.

Making a Tape Sandwich. Explain to the students that they will use strips of tape to collect dirt and dust samples from various locations.

1. Show the students how to make a tape "sandwich."

- Open a plastic tape-transfer sheet and lay it flat on a table.
- Place 4 eight-centimeter pieces of double-stick tape on one half of the sheet.
- Fold the other half of the sheet over to form a "sandwich."
- Place 4 nine-centimeter pieces of *regular* tape on the outside of the sandwich.



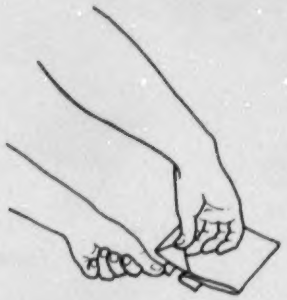
2. Have the students work in groups of eight to make their sandwiches.

- Give each *student* a tape-transfer sheet, and each *group* a roll of double-stick tape, a roll of regular tape, and a metric ruler.
- Allow enough time for the students to make their sandwiches.
- Collect the tape dispensers after the students have finished.

Demonstrating the Sampling Technique

1. Explain to the students that the pieces of double-stick tape are their dust-and-dirt collectors.

2. Show the students how to transfer the double-stick tape from the plastic sheet onto a surface where the tape can collect dirt and dust particles.



- Choose a spot in the classroom (e.g. the rim above the chalkboard), and wipe it clean.
- Press one of the pieces of double-stick tape onto the clean spot. Carefully pull the plastic sheet away so that the tape remains in place.

3. Show the students how to collect their samples.

- Cover the strip of double-stick tape with a piece of regular tape.
- Pull up both pieces of tape together, and press them onto an index card.
- Near the tape strip on the index card, record where the tape strip was and the length of time it was left in place.
- Explain that each student should place his four strips on the same index card.

4. Tell the students that they are to:

- Set out tape strips at school (one inside and one outside the classroom).
- Set out two tape strips at home (one indoors and one outdoors).

Explaining the Face-Mask Procedure

1. Ask the students to collect one particle mask, one index card, one sealable plastic bag, and one Face Mask Observation Card from the distribution stations.

- Have the students examine their particle masks and try them on.
- The masks can be custom fitted by pinching the metal strip against the bridge of the nose.

2. Explain that between now and the second part of the activity, the students should wear their particle masks for at least two hours while doing dusty activities.
- Have the class develop a list of dusty activities.
- Tell the students to fill in all the information on their Face Mask Observation Cards each time they wear the mask.

3. Tell the students to store their materials in their sealable plastic bags when they are not using them.

4. Store one clean particle mask to compare with the others later.

Collecting Air-Pollution Data

1. Give the students enough time to set out two tape strips at school.

2. Working at Home. Remind the students to:
- set out the other tapes at home.
- wear their masks for at least two hours while doing dusty tasks during the week.
- check their tape strips daily to see how much dust has collected on them.
- bring all their materials, including the plastic sandwich, back at the end of the week.

3. Make an equipment bag, and collect your own samples!

THE ACTIVITY: PART TWO

Analyzing the Data

1. Make sure all the students have their masks and tape strips in front of them. Ask them:
- What evidence do you have that there is dirt and dust in the air?
- Have you ever played on a dusty field and later blown dirt from your nose?
- What is there in your nose that could filter dirt and dust? How do they work?
- How is the particle mask similar to the hair in your nose?
- How is the tape similar to the mucus in your nose?

2. Explain that the body's air-quality control system includes not only nose hair and mucus, but also tiny hairs called ***cilia.*** The cilia line the nasal passages and move constantly to push out dirt- and germ-laden mucus. Ask the students:
- What do you think would happen if the cilia action were slowed down or stopped?
- Can you think of any harmful substances that the body's air-quality control system might not be able to handle?
- When would wearing a particle mask be a good idea?

3. Remind the class of the secret observations they made during the first session. Ask them:
- Does mouth-breathing take full advantage of the body's air-cleansing system? Why?
- Can you decide to be a nose-breather or a mouth-breather?
- When are you forced to breathe through your mouth?

4. Give the students their Secret Observation Cards made during the first session so that they can see if they are mouth-breathers.

HEALTH APPLICATIONS

What can we do about smokers and other smoke producing agents in our personal environments?

HAP SIDETRIPS

1. Use tape strips to compare the amounts of dirt and dust in the air during different times of the year at the same place.

2. Inspect the tape strips under a microscope. What do the pollutants look like?

Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

Supported by a grant
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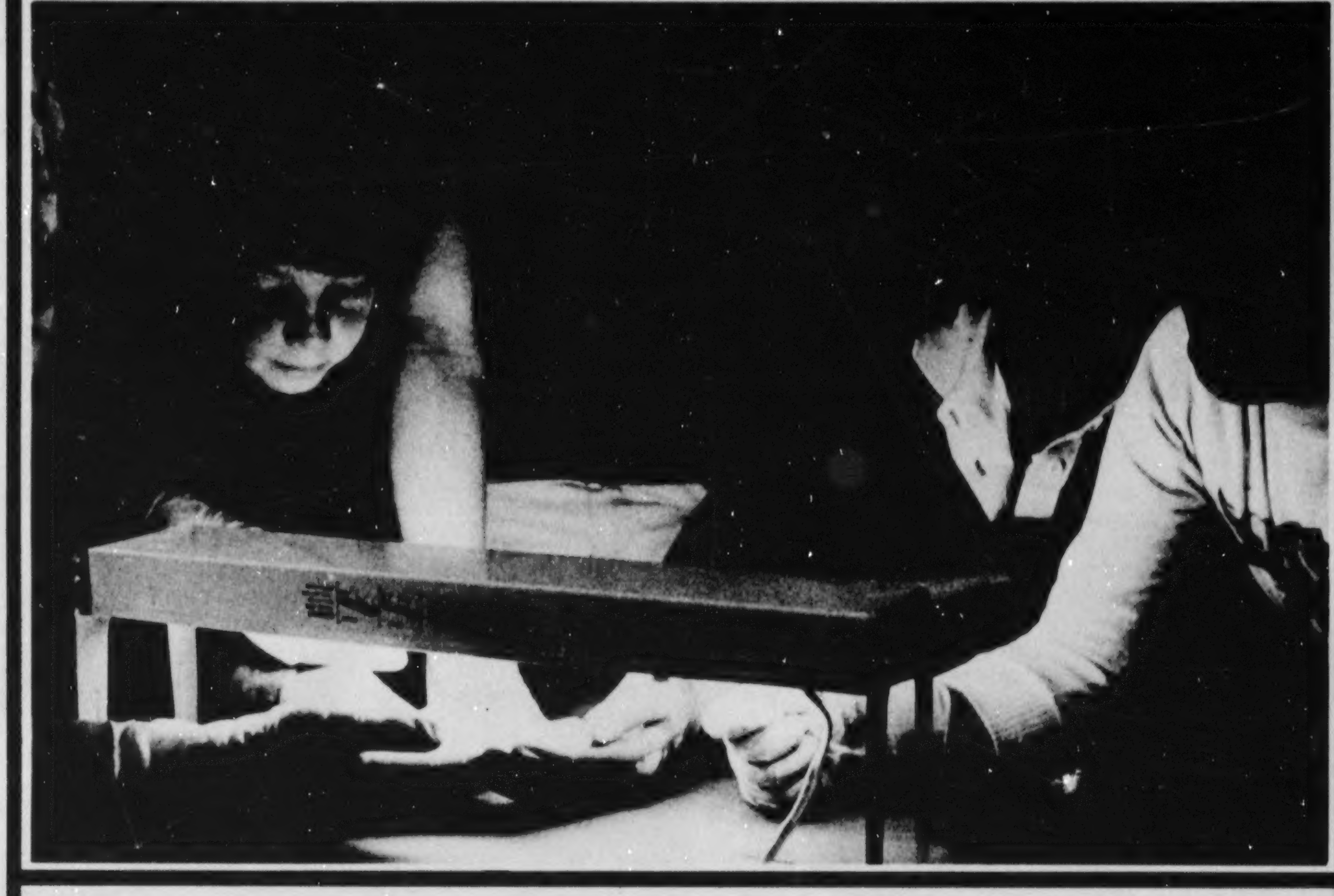
EPIDEMIC



OVERVIEW

The students unknowingly simulate the spread of micro-organisms through touch, and then discuss ways of controlling the spread of disease.

HEALTH BACKGROUND

One reason that we live longer and healthier lives than did people of previous generations is that we can now protect ourselves against many contagious diseases. Personal hygiene, better sanitary conditions, and medical advances have all combined to help eliminate illnesses that were once responsible for many deaths.

Recent statistics show an alarming rise in childhood diseases, reportedly due to a decrease in the vaccination rate. Figures recently released by the Center for Disease Control in Atlanta, Georgia reveal that nearly 20 million children under sixteen have not received immunization against one or more serious communicable diseases. Childhood diseases can be controlled by protective vaccinations.

In this activity, the students become aware of one way that germs and disease spread and how this spread can be effectively controlled.

MATERIALS

For each student:
1 small disposable glove
1 Student Sheet E 1
1 Immunization Card* (from Student Sheet E 2)

For each team of six to nine students:
1 plastic chip (disposable)
1 blank index card*

For the class:
1 ultraviolet (UV) fluorescent lamp
1 pair of small disposable gloves (for the demonstration)
¼ tsp. of blacklight paste (non-toxic)
1 plastic bag
1 sheet of cobalt chloride paper (optional, for HAP Sidetrip)
2 shoe boxes* (or other small boxes)
masking tape* (optional)
duplicator masters of Student Sheets E 1 and E 2

For the teacher:
1 large disposable glove to wear while dispensing the gloves (The large glove is marked with an orange "L" and is packed on top of the other gloves.)

*Provided by the teacher.

SETTING UP

Suggested Time:

- Plan for 30 minutes for Part One.
- Plan for 10 minutes on each of two days for Part Two.

Preparing for the Activity

1. Setting up the Room

- Find a room that you can completely or partially darken. Make sure that facilities for hand-washing are available.
- Select a spot in the room where you can place the UV lamp. It should be positioned in such a way that students can easily view their hands under the lamp but have difficulty looking directly at the bulb. Although this particular light is not dangerous, we don't want to encourage looking directly at any UV bulb — other UV bulbs are *not* safe. (Don't place the lamp in view until after the youngsters have "contaminated" each other.)

2. "Contaminating" Five Gloves. (Be careful not to contaminate any other objects. The spread of the blacklight paste must be due *only* to the actions of the students.)

- Wearing a pair of disposable gloves, completely cover both gloves with blacklight paste. (If your hands are too large for the gloves, you may want to have someone with smaller hands contaminate the gloves.)
- Make sure the contaminated gloves look the same as uncontaminated gloves in normal light.
- In the same manner, contaminate three more gloves, and place all five contaminated gloves in the plastic bag. Be careful not to contaminate the outside of the bag.
- After thoroughly washing your hands with soap and hot water, check your hands under the UV lamp to make sure they are free of paste.

3. Packaging the Materials. Place the clean gloves and the plastic bag of contaminated gloves in one shoe box, and the blank index cards and plastic chips in the other shoe box.

4. Duplicate the Student Sheets. Cut apart the copied Immunization Cards (Student Sheet 2).

THE ACTIVITY: PART ONE

Note: Use the following procedure and "cover" story to allow the students to unknowingly spread the "disease." Do *not* mention the name of the activity.

Exposing the Students to the "Disease"

1. With an uncontaminated large glove on your non-preferred hand, stand at the door holding the box of gloves.

2. As the students enter the classroom, distribute the gloves, giving out the four contaminated gloves at random with your gloved hand, and the clean gloves with your bare hand.

- As you hand out the gloves, tell the students to put the gloves on their preferred hands.

3. After distributing the gloves, return yours to the box.

IMMUNIZATION SCHEDULE

The U.S. Public Health Service suggests the following schedule for immunizations:

DISEASE	INITIAL INOCULATION*	BOOSTERS	SPECIAL NOTES
D-P-T (Diphtheria, Pertussis or Whooping Cough, Tetanus)	As young as 2 months	Additional immunizations at 4, 6, and 18 months. A booster on entering school.	Tetanus toxoid booster may be necessary following a puncture wound.
Polio	2 months	Additional immunizations at 4 and 12 months. A booster on entering school.	May be needed again in areas with known cases.
Measles	15 months		Earlier if there is an outbreak.
Mumps	15 months		Especially important to adolescent males who have not had the disease. Tell your doctor if you are allergic to eggs.
German Measles (Rubella)	Between one and two years (particularly important to girls)		All women should be tested and, if necessary, immunized two months prior to becoming pregnant.

*These are minimum ages. Older children who are not yet vaccinated should start their immunizations without delay.

IMMUNIZATION CARDS

IMMUNIZATION RECORD OF: ____________________

Record in the boxes provided the dates (month/day/year) when you received these basic immunizations. (Each box is for a different date.)

	First Series			Boosters		
DPT: Diphtheria – Pertussis – Tetanus						
DT: Diphtheria – Tetanus						
	First Series			Boosters		
OPV: Oral Polio Vaccine						
			Mumps	Measles	Rubella	
MMR: Mumps – Measles – Rubella		or				

T.B. Tests: Record dates and circle whether reaction was positive or negative.

– +	– +	– +	– +	– +

ADDITIONAL IMMUNIZATIONS: Record here the names and dates of any additional immunizations, e.g. flu vaccinations or immunizations prior to foreign travel.

IMMUNIZATION	DATE(S)

IMMUNIZATION RECORD OF: ____________________

Record in the boxes provided the dates (month/day/year) when you received these basic immunizations. (Each box is for a different date.)

	First Series			Boosters		
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OPV: Oral Polio Vaccine						
			Mumps	Measles	Rubella	
MMR: Mumps – Measles – Rubella		or				

T.B. Tests: Record dates and circle whether reaction was positive or negative.

– +	– +	– +	– +	– +

ADDITIONAL IMMUNIZATIONS: Record here the names and dates of any additional immunizations, e.g. flu vaccinations or immunizations prior to foreign travel.

IMMUNIZATION	DATE(S)

HEALTH ACTIVITIES PROJECT

Secretly Spreading "Disease" by Direct Contact

1. Tell the students that they are going to find out how the gloves affect their coordination in a relay race.

2. Divide the class into four teams with a minimum of six students per team.

3. Have each team form a line in a different part of the room. (These movements allow the students to contaminate each other through direct contact.)

Spreading "Disease" by Indirect Contact

1. With your own uncontaminated hand, give each team one plastic chip and one index card from the box. Leave the fifth chip and index card in the box for later demonstration.

2. Tell the students that they are going to run a chip-passing relay.

- Explain that at your signal, the members of each team will pass the chip down the line and back again with their gloved hands.
- Tell each team to choose a team name and record it on their index card. Tell them that they will also record their relay times on the cards.

3. Allow the students time to "get organized for the relay" (i.e., indirectly contaminate each other by touching the cards and chips).

4. Now tell the students that you have some other directions to explain, and ask them to return to their seats.

- *Now* bring out the UV lamp and set it in place.

Finding Telltale Signs

1. Tell the students that they have just participated in an experiment — there is not really going to be a relay race.

2. Remove one clean and one contaminated glove from the box, and ask the class if they can see any difference between the gloves.

3. After darkening the room, hold the two gloves, the clean plastic chip, and the clean index card under the UV light.

- Explain that all but four of the students received uncontaminated gloves; the four received gloves coated with blacklight paste.
- Emphasize that *only four* students should have green gloves. Explain how careful you were not to contaminate any of the other gloves, the chips, and the index cards.

4. Have each of the teams view their hands, chips, and index cards under the UV light.

5. Ask the students to remove their gloves and examine their hands. They should then wash up.

Analyzing the Results of Part One

1. Ask the students what they discovered.

- If only four gloves were contaminated originally, why did so many others also have green spots?
- How could the chips and cards have become contaminated?

2. Which students had gloves that were green all over? (Write their names and team names on the chalkboard.)

3. Also record the number of students who had green spots on their gloves or their bare hands, and the number of students who had no spots.

4. Ask the students:

- Were the students with green spots on the same team as one of the four students with the contaminated gloves?
- Do the "spotted" students remember touching hands with those contaminated students?

5. Ask the class to imagine that the four people who received contaminated gloves were infected with the measles.

- What would be likely to happen to the students who picked up green spots during this activity?
- Would all of them develop the measles?
- How many of the students with green spots have had measles vaccine?

Cleaning Up. Discard all the disposable gloves and the four contaminated chips and index cards.

THE ACTIVITY: PART TWO

Introducing Part Two

1. Ask the students how many had green spots on their gloves, but not on their gloved hands. Why weren't their hands spotted?

2. Tell the youngsters that vaccines protect people from specific diseases as the gloves protect the hands from the paste.

Filling Out Immunization Cards

1. Inform the students that the U.S. Public Health Service suggests immunization of children for many diseases, such as diphtheria, tetanus, and pertussis (whooping cough), polio, measles, mumps, and German measles.

2. Give each student a copy of Student Sheet 1 and an Immunization Card.

3. Ask the students to take the cards home and fill out the dates on which they received the various immunizations. Ask them to return the completed cards within three days. Student Sheet 1 is an information sheet for them to keep at home.

4. Assign pairs of students to find out what effects each of the diseases on Student Sheet 1 have on people.

5. Inform the students that most community health services provide free immunizations. Stress the importance of talking to a doctor about immunizations they have not received.

Discussing the Immunization Cards

1. If students were able to find out how old they were when they received the first of each of the vaccines, ask them to share this information with the class.

2. Why do they think young children should be vaccinated?

3. Have the students share the results of their findings on the effects of the diseases they researched.

HEALTH APPLICATIONS

1. If you must care for a relative or friend who has a contagious disease, what can you do to minimize your chances of getting the disease?

2. If you have a contagious disease, how can you minimize the chances of giving it to someone?

HAP SIDETRIPS

1. Ask a student to hold a piece of cobalt chloride paper about 15 centimeters away from her face and to sneeze or simulate a sneeze aimed at the paper.
  - What happened to the paper?
  - Why do you think people cover their mouths when they sneeze?

2. Create cartoons about good health practices such as washing your hands after going to the bathroom or using tissues when sneezing.

Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

Supported by a grant
from the Robert Wood Johnson
Foundation to the Association of
Science-Technology Centers.

TURN AROUND

OVERVIEW

After discovering that turning to look at something can affect their steering of a bicycle or automobile, the students try to improve their steering skills.

HEALTH BACKGROUND

Lane changes, turns, sudden movements, loud noises, or interesting sights are just a few of the reasons why automobile drivers and bicyclists turn their heads to look sideways or to the rear. Few people realize, however, that the upper part of the body often turns along with the head. When a bicyclist or a motorist turns his head to look at something, the accompanying movement of the upper body can also result in movement of the handlebars or steering wheel. Depending on the speed at which the car or bike is moving and the proximity of other vehicles or obstacles, even a slight steering change can cause an accident. Fortunately, a person can control the tendency of his upper body to turn along with his head.

Nine out of ten accidents involving bicycles are the fault of the bicyclist. This activity alerts students to the potential hazards of turning to look at something while steering a moving vehicle. The students practice head-turning techniques that do not affect their steering.

MATERIALS

For each team of four:

1 Steering Simulator (bicycle or auto)
1 Student Sheet TA 1*
4 copies of Student Sheet TA 2* *or* Student Sheet TA 3*

For the class:

1 "Steering Simulation" Procedure Card
1 "Steering Simulators" Equipment Card
duplicator masters of Student Sheets TA 1, TA 2, and TA 3

*Provided by the teacher.

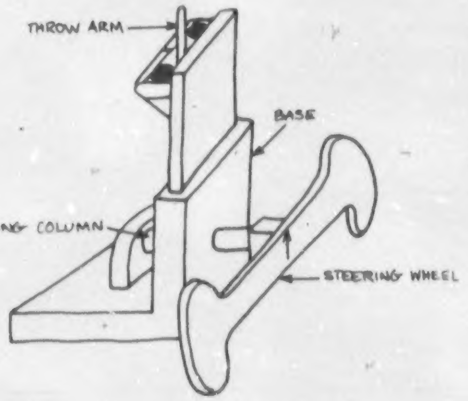
SETTING UP

Suggested Time:

- Plan for 50 to 60 minutes for Part One.
- Plan for 40 to 60 minutes for Part Two.

Preparing for the Activity

1. Assemble one steering simulator for each team. (See the Equipment Card.) Half the teams will have bicycle simulators, and the remaining teams will have auto simulators.



2. Duplicate the Student Sheets: one Student Sheet 1 for each team, one Student Sheet 2 for each bicycle-team member, and one Student Sheet 3 for each auto-team member.

3. Read the Procedure Card, the Equipment Card, and the Student Sheets to familiarize yourself with the procedures.

THE ACTIVITY: PART ONE

Introducing the Activity

Note: *Do not* reveal any information in the Health Background to the students.

1. Ask the students to describe situations in which a motorist or bicyclist might turn her head to look behind or beside her.

2. Tell the students that they are going to find out how rapidly and accurately they can identify movements taking place around them while they simulate steering a bicycle or a car.

Demonstrating the Steering-Simulation Procedure

1. Show the students how to set up both simulators. (See the Equipment Card.)

- Explain that the bicycle simulators can also represent motorcycles moving at high speeds.

2. Choose four students to help you demonstrate the steering procedure described on the Procedure Card.

3. Explain that each student takes a turn as the DRIVER.

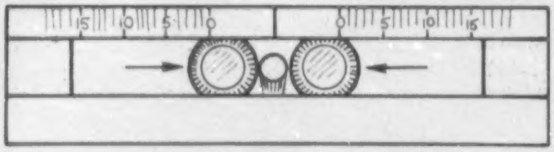
Discovering the Turning Response

1. Divide the class into teams of four students.

2. Give each team a copy of Student Sheet 1.

3. Tell the teams to record their data in the Part One section of the Student Sheet.

4. Remind the teams to move the chips against the centered throw arms before starting each trial.



5. Suggest that the DRIVER practice identifying a few hand movements before she begins her trial.

6. Distribute bicycle simulators to half the teams, auto simulators to the other teams, and let them begin.

TEAM TALLY SHEET

PART ONE

DRIVER'S NAME	Mark + for right and – for wrong.									
EXAMPLE	+	–	+	+	–	–	+	+	–	+
1.										
2.										
3.										
4.										

NUMBER OF CORRECT ANSWERS	CHIP READING ON DRIVER'S *LEFT*	CHIP READING ON DRIVER'S *RIGHT*
6	2	6

PART TWO

DRIVER'S NAME	Mark + for right and – for wrong.									
1.										
2.										
3.										
4.										

NUMBER OF CORRECT ANSWERS	CHIP READING ON DRIVER'S *LEFT*	CHIP READING ON DRIVER'S *RIGHT*	STEERING TECHNIQUES TRIED

Cyclist's Name________________________ Student Sheet TA 2

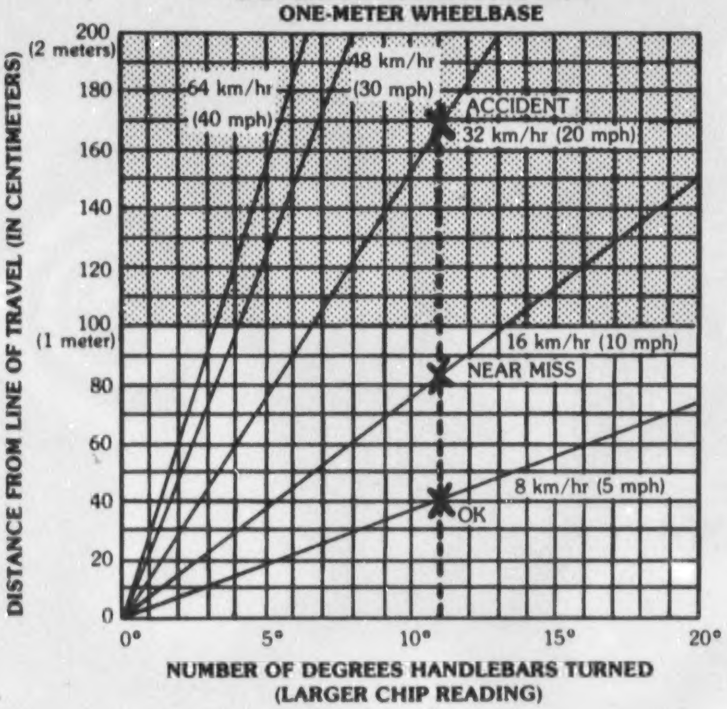
BICYCLE OR RIDING SITUATION

You are riding a bicycle down a street. There are parked cars one meter away on your right, and moving cars one meter away on your left. Use the graph below to find out if you would have had an accident if you were riding at:

- 8 km/hr. (slow pedaling)
- 16 km/hr. (pedaling at half speed)
- 32 km/hr. (pedaling at full speed)

To find out if you would have had an accident if you were riding a motorcycle, check the 48 km/hr. and 60 km/hr. lines.

BICYCLE OR MOTORCYCLE WITH ONE-METER WHEELBASE



To see if you would have had an accident:

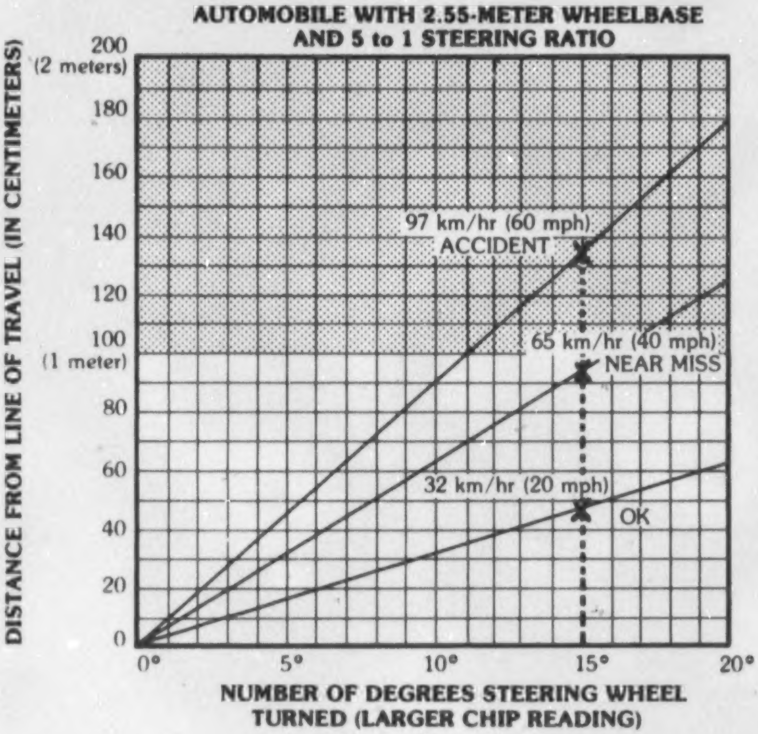
1. Find the larger of your two chip readings on your Team Tally Sheet (last two colums).
2. Find this larger chip reading along the bottom of the graph.
3. Follow that degree line up to each of the diagonal speed lines.
4. With an X, mark each point where your degree line crosses the diagonal lines.
   - If any of your X's are in the shaded area, you would have had an accident.
   - At 48 and 64 km/hr., any reading larger than 4° means that the cyclist would have had an accident.
   - In the example on the graph, the larger chip reading is 11°. The cyclist would not have had an accident at 8 and 16 km/hr., but would have had an accident at the three higher speeds.
5. OPTIONAL. To find out how far your bicycle or motorcycle strayed from your original line of travel at the different speeds, move straight across to the left side of the graph from each X.
   - The number that you reach on the left side of the graph is the number of centimeters you moved away from your original line of travel in one second.

Driver's Name________________________________ Student Sheet TA 3

AUTOMOBILE DRIVING SITUATION

You are driving a car down a street. There are parked cars one meter away on your right, and moving cars one meter away on your left. Use the graph below to find out if you would have had an accident if you were driving at:

- 32 km/hr. (20 mph)
- 65 km/hr. (40 mph)
- 97 km/hr. (60 mph)



AUTOMOBILE WITH 2.55-METER WHEELBASE AND 5 to 1 STEERING RATIO

To see if you would have had an accident:

1. Find the larger of your two chip readings from your Team Tally Sheet.
2. Find this larger chip reading along the bottom of the graph.
3. Follow that degree line up to each of the diagonal speed lines.
4. With an X, mark each point where your degree line intersects with the diagonal lines.
   - If any of your X's are in the shaded area, you would have had an accident.
   - In the example on the graph, the larger chip reading is 16°. The driver would not have had an accident at 32 km/hr., would have had a near miss at 65 km/hr., and would have had an accident at 97 km/hr.
5. OPTIONAL. To find out how far your car strayed from your original line of travel at the different speeds, move straight across to the left from each X to the left side of the graph.
   - The number that you reach on the left side of the graph is the number of centimeters you moved away from your original line of travel in one second.

Turn Around
Equipment Card

STEERING SIMULATORS

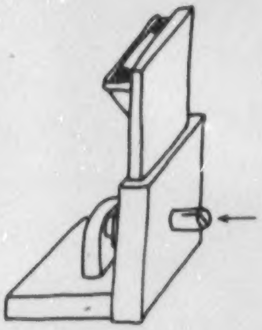
AUTO SIMULATOR

MATERIALS FOR ONE AUTO SIMULATOR:

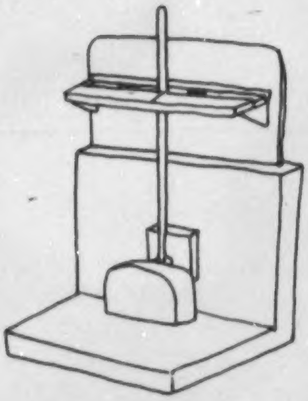
1 base
1 *short* steering column
1 throw arm
1 steering wheel (straight axis)

ASSEMBLING THE AUTO SIMULATOR

1. Stand the auto simulator base on its rubber pads, and slide a *short* steering column (dowel) into the center hole so the slotted end is sticking out.



2. Insert the slotted end of the throw arm down behind the scale, between the two plastic chips, and into the hole in the steering column.



3. With one hand, hold the throw arm at the center mark on the scale. With the other hand, hold the steering wheel so its hub faces the steering column, and the axis is parallel to the bottom of the base, and push the wheel straight onto the slotted end of the *steering column*.

4. Place the simulator at the edge of a table or desk so that the wheel is free to turn. Set several books on the base to anchor the simulator.

BICYCLE SIMULATOR

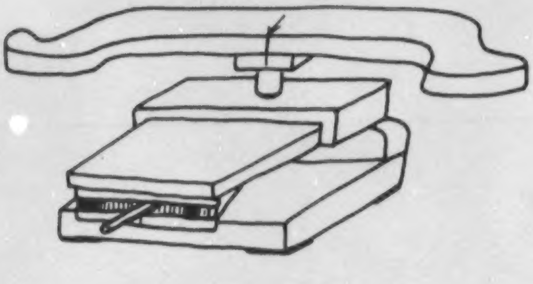
MATERIALS FOR ONE BICYCLE SIMULATOR:

1 base
1 *long* steering column
1 throw arm
1 handlebar (curved axis)

ASSEMBLING THE BICYCLE SIMULATOR

1. Follow the Auto Simulator directions to assemble the Bicycle Simulator.

- The handles on the handlebar should point towards the driver.



2. Place the Bicycle Simulator, with the handlebars on top, at the edge of a table. No books are needed to anchor this simulator.

Turn Around
Procedure Card

STEERING SIMULATION

TEAM ROLES

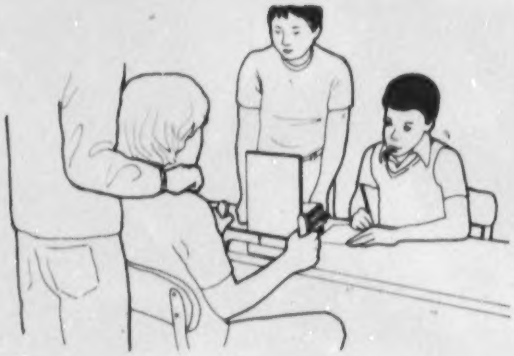
Each team has four roles:

1. The DRIVER steers the wheel or handlebars and, at the same time, tries to identify hand movements.

2. The HAND-MOVER makes ten hand signals in one minute (not necessarily at regular intervals).

3. The CHECKER watches the HAND-MOVER's hands and announces whether the DRIVER is right or wrong.

4. The RECORDER records the number of right or wrong hand-movement identifications the DRIVER makes, lets the HAND-MOVER know when he has made ten signals, and reads the chip movements on the scale.



Note: The same procedure applies to both the Auto and Bicycle Simulator trials. If you need to make teams of three students, eliminate the CHECKER and have the HAND-MOVER announce the DRIVER's scores.

TEAM POSITIONS

1. The DRIVER sits in front of the simulator and grips the steering wheel (or handlebars) with both hands. Ask the DRIVER to position herself so that she feels comfortable.

2. The RECORDER sits on the opposite side of the table, facing the DRIVER and the scale on the simulator. The RECORDER has a copy of the Team Tally Sheet (Student Sheet 1) and a pencil.

3. The HAND-MOVER stands directly behind the DRIVER and holds his closed fists (palms down) on each side of the DRIVER's head, shoulders' width apart, and *at the DRIVER's eye level.*

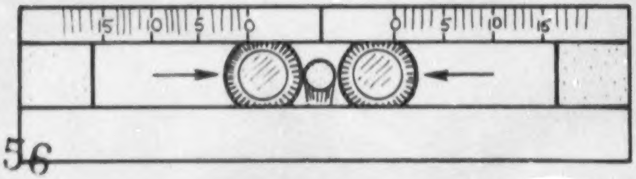
- The DRIVER should be able to see both hands out of the corners of her eyes when she looks straight ahead.
- The DRIVER should look straight ahead, focusing on something at least five meters away.

4. The CHECKER should stand where she can see both of the HAND-MOVER's hands.

TEAM PROCEDURE

1. When the DRIVER is ready to begin (has her hands on the steering wheel), the RECORDER makes sure the throw arm is centered.

- Before each trial, the RECORDER should center the throw arm and slide the two plastic chips against it. Sometimes the steering wheel might need readjustment to center the throw arm.



2. To simulate movements that occur around drivers and cyclists, the HAND- MOVER should move one hand at a time *straight back (not down)* to his side (no farther, or the HAND-MOVER's body will obscure the hands) and display zero to five fingers on that hand for about one second.

- Fingers should point towards the floor.

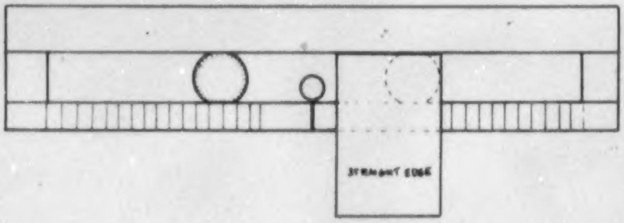
3. As soon as the DRIVER notices the hand moving back, she turns around to see how many fingers are displayed and announces the number as she turns back to look straight ahead.

4. The DRIVER must react quickly because the HAND-MOVER will be making ten hand movements in one minute or less.

- After looking to one side or the other, the DRIVER looks forward to prepare for the next signal.
- The CHECKER says "Right" for a correct response and "Wrong" for an incorrect response.

5. The RECORDER marks a "+" for right answers and a "–" for wrong answers in the boxes next to the DRIVER's name on the Student Sheet.

6. After ten hand movements, the RECORDER says "Stop!" and the DRIVER freezes while the RECORDER finds out how far the chips have moved by lining up a straight edge (3" x 5" card or folded piece of paper) with the *outside edge* of each chip and reading the number off the scale as illustrated.



7. The RECORDER records the number of correct responses the DRIVER made and the two chip readings. (See the example on Student Sheet 1.)

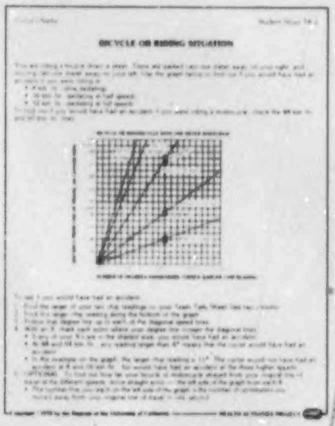
8. If your students ask about the significance of the chip movements, stall them by telling them that they will find out later after all the teams have completed their trials.

7. Collect the simulators after all the teams have completed their trials.

Analyzing the Data

1. Ask the students:
- How many hand movements did you identify correctly?
- What are some driving or bicycling situations where failure to notice something happening around you could be dangerous?
- What sometimes happened to your steering wheel or handlebars when you turned your head quickly? (Explain that the chip readings indicate the number of degrees the steering wheel or handlebars turned to the right or left from the original line of travel.)

2. Read the "Driving Situation" on one of the Student Sheets to the class.



- Go over the examples on the Student Sheets to show the students how to use the graph. With it they can determine if the number of degrees they turned their steering wheel or handlebars would have caused an accident at different speeds.
- Explain that if they had an accident at 32 km/hr., they would also have had increasingly severe accidents at 46 and 60 km/hr.

5. Distribute Student Sheets 2 and 3 to the appropriate teams, and help the students who have trouble using the graphs.

6. After the students have completed their graphs, find out how many bicyclists/motorcyclists had accidents at each different speed.

- Emphasize that the accidents would occur within one second of turning the steering wheel or handlebars.

7. Collect and save the copies of Student Sheet 1 for Part Two.

THE ACTIVITY: PART TWO

Introducing Part Two

1. Ask the students if they think they can turn their heads to look at something without turning their bodies. On the chalkboard, list suggestions for eliminating upper body movement (e.g. relaxing the arms, tucking elbows against the body, looking quickly).

2. Tell the students that they are going to conduct a second steering simulation to see if they can improve their performances.

Improving Steering Skills

1. Tell the students that they will be working in their same teams and using the same trial procedure and simulator that they used before.

2. Return the simulators and Team Tally Sheets (Student Sheet 1) to the teams. Before they start their trials, each team should:
- Decide on one or more techniques to try.
- Record the techniques in the last column under Part Two.

4. Let the teams begin.

5. After the students have completed their trials, collect the simulators.

Analyzing the Data

1. Ask the students:
- How did your Part One performance compare with your Part Two performance?
- What techniques worked best in keeping the steering wheel or handlebars from turning?
- How did your new steering techniques affect your ability to identify the hand movements correctly?

2. Let several students demonstrate their techniques for keeping their steering wheels or handlebars from turning.

HEALTH APPLICATIONS

1. Ask the students if they can think of other steering practices that are potentially dangerous (driving with one hand, bike riding with no hands, grasping the steering wheel near its center, smoking while driving).

2. Ask some students to demonstrate poor steering practices on a simulator for the rest of the class.
   - Discuss with the students why such practices might be dangerous.

HAP SIDETRIPS

Find out how the following variations affect your students' ability to steer and to identify hand movements beside them.

- Doubling the speed at which the hand movements occur.
- Reading out loud from a book during a trial.

- Unwrapping and eating a piece of food during a trial.
- Carrying on a conversation with someone during a trial.

Health Activities Project
Developed by the Lawrence Hall of Science
University of California, Berkeley

Supported by a grant
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HEAT TRAPS

OVERVIEW

The students test the insulation effectiveness of wet and dry fabrics.

HEALTH BACKGROUND

When the air is cold and the body is unprotected, the body loses heat. When too much heat is lost, the body's core temperature drops (hypothermia), and even death may result. Clothing traps some of the body's heat as a layer of warm air, and holds it against the skin. The amount of protection provided by particular fabrics is determined by the effectiveness with which they keep the body's heat from escaping; the fabrics do not *provide* warmth. Substances effective in preventing heat transfer are called *insulators*.

Most children realize that wool shirts or sweaters keep them warmer in the winter than do cotton shirts. However, many consider the warmth to be a property inherent in the material, or think that the warmer material does not let in as much cold. Few children understand that clothing acts as an insulator and prevents their own body heat from being lost to the environment.

Tightness of weave, type of fiber, weight of the material, and the amount of moisture are all properties that contribute to the insulating effectiveness of different types of fabrics. Two layers of fabric more than double the fabric's effectiveness as an insulator because the layers trap pockets of warm air not only between the first layer and the skin, but also between the two layers.

MATERIALS

For each student:

1 Heat Trap, unassembled (See the Equipment Card.)
1 HAP Strip Thermometer
1 rubber band
Student Sheets HT 1 and HT 3*

For the class:

72 squares of fabric (12 each of 6 different kinds of fabric)
extra rubber bands
masking tape*
clock*
4 copies of Student Sheet HT 2*
4 copies of Student Sheet HT 4*
1 "Heat Trap" Equipment Card
1 "Using the HAP Strip Thermometer" Technique Card
duplicator masters of Student Sheets HT 1, HT 2, HT 3, and HT 4

*Provided by the teacher.

SETTING UP

Suggested Time:

- Plan for 50 to 60 minutes for Part One.
- Plan for 50 to 60 minutes for Part Two.

Preparing for Part One

1. Select a cool (below 22°C), draft-free area, e.g. a hallway, the auditorium, or a sheltered shady outdoor site for the activity.

2. Make four piles of fabrics.

- Each pile should contain 18 squares of fabric, 3 squares of each of the 6 different fabrics.

3. Duplicate the Student Sheets. Make extra copies of Student Sheet 3.

THE ACTIVITY: PART ONE

Introducing the Activity

1. Encourage the students to pretend that the only tops they own are cotton T-shirts, cotton/polyester shirts, wool shirts, wool sweaters, cotton/polyester windbreakers, and plastic raincoats.

- List each of the garments on the board, and tape the appropriate squares of fabrics next to the garments listed.
- Ask the students to describe situations in which their choice of clothing could be crucial to their health or survival.
- Ask which garment(s) they think would be best in each of those situations.

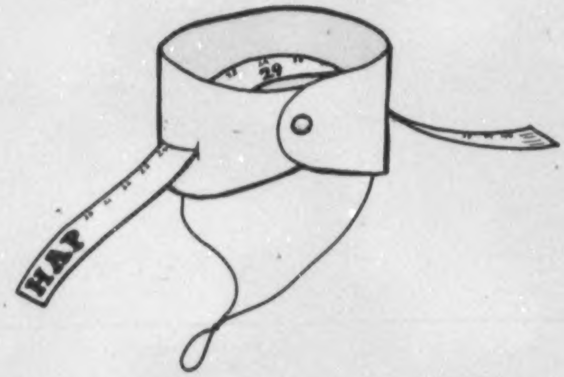
2. Tell the students that they will measure the heat-trapping ability of these different types of cloth. Explain that materials that prevent heat from escaping are called *insulators*.

Demonstrating and Practicing the Use of the Equipment.

1. Distribute the Strip Thermometers.

- Show the students how to use the Thermometers and how to determine half-degree intervals. (See the "Using the HAP Strip Thermometer" Technique Card.)
- Ask the students to measure the temperature at several different parts of their bodies. (Give them about ten minutes.)

2. Distribute the materials for the Heat Traps, and show the students how to assemble and use the Traps. (See the "Heat Trap" Equipment Card.)



- Have the students assemble their Traps and thread their Thermometers into the Traps.

3. Explain the procedure for testing fabrics.

- The students work in pairs.
- First, each student puts a Heat Trap on her upper arm, waits until the termperature doesn't change anymore, measures the temperature inside the Trap, and records this temperature on Student Sheet 1.

Name____________________________ Student Sheet HT 1

TESTING SINGLE LAYERS OF FABRIC

1. Which fabric do you predict will keep you warmest? ______________________________
2. Which fabric do you predict will not keep you warm? ______________________________
3. Test your predictions by measuring the effect of two fabrics. Record your observations in the boxes below.
   - In column A, record the type of fabric.
   - In column B, record the temperature in the Heat Trap before a fabric is attached.
   - In column C, record the temperature in the Heat Trap *two minutes* after attaching the fabric.
   - In column D, subtract the smaller number from the larger number (B and C) and record the difference.
   - In column E, check the effect of the fabric.
     a. Check *warmer* if C is larger than B.
     b. Check *cooler* if C is smaller than B.

A. TYPE OF FABRIC	B. TEMPERATURE IN TRAP BEFORE ATTACHING FABRIC	C. TEMPERATURE IN TRAP AFTER ATTACHING FABRIC	D. DIFFERENCE	E. EFFECT OF FABRIC (CHECK ONE.)
				______warmer ______cooler
				______warmer ______cooler

Names__________________________ Student Sheet HT 2

GROUP TALLY SHEET FOR DRY FABRICS

Follow these steps to combine the data from the teams in your group.

1. Each time a piece of fabric is tested, place a dot in the box that represents the temperature change that the fabric caused in the Heat Trap. (Look at the last two columns of Student Sheet 1.)
   - If the temperature in the Heat Trap was warmer, put the dot in the appropriate box *above* zero on the chart.
   - If the temperature in the Heat Trap was cooler, put the dot in the appropriate box *below* zero on the chart.
2. If any fabric has not been tested at least once by someone in your group, have one or two teams test it now. Record the data on the chart below.

CHANGE IN TEMPERATURE (°C)	DRY FABRICS IN STILL AIR					
+4.5						
+4.0						
+3.5						
+3.0						
+2.5						
+2.0						
+1.5						
+1.0						
+0.5						
0 −0.5						
−1.0						
	Cotton T-Shirt	**Cotton/ Polyester Shirt**	**Wool Shirt**	**Wool Sweater**	**Cotton/ Polyester Windbreaker**	**Plastic Raincoat**

3. Now determine the three best insulators, and list them below.
   - The fabric that trapped the most heat (i.e., had the largest positive change in temperature) the most often is the *best insulator*.

BEST INSULATOR __________________________

SECOND BEST INSULATOR ________ 163 ________

THIRD BEST INSULATOR __________________________

Name______________________________ Student Sheet HT 3

TESTING WET FABRICS

Which wet fabric did you test?____

Test the fabric in both *still air* and *moving air* by following these steps. (Make the *still air* test first; then make the *moving air* test.)

A. Record the type of fabric in column A.

B. Temperature in the Heat Trap.
  1. **Still Air Test.** Put on the Heat Trap. Record the temperature in the Trap in column B.
  2. **Moving Air Test.** Let the temperature in the uncovered Heat Trap return to normal. Record the temperature in column B.

C. Temperature in the Heat Trap with Fabric Attached.
  1. **Still Air Test.** Attach the wet fabric to the Heat Trap, and sit still for two minutes. Remove the fabric and read the temperature. Record the temperature in column C.
  2. **Moving Air Test.** Attach the wet fabric to the Heat Trap and walk at a normal pace for two minutes. Remove the fabric and read the temperature. Record the temperature in column C.

D. Subract the smaller number from the larger number (B and C) and record the number in column D.

E. Check the effect of the fabric.
  - Check *warmer* if C is larger than B.
  - Check *cooler* if C is smaller than B.

	A. TYPE OF FABRIC	B. TEMPERATURE IN TRAP BEFORE ATTACHING FABRIC	C. TEMPERATURE IN TRAP AFTER ATTACHING FABRIC	D. DIFFERENCE	E. EFFECT OF FABRIC (CHECK ONE.)
1. WET IN STILL AIR					______ **warmer**
					______ **cooler**
2. WET IN MOVING AIR					______ **warmer**
					______ **cooler**

Names________________________________ Student Sheet HT 4

GROUP TALLY SHEET FOR WET FABRICS

Follow these steps to combine the data from the students in your group.

1. Each time a piece of fabric is tested, put a dot in the box that represents the temperature change that the fabric caused in the Heat Trap. (Look at the last two columns of Student Sheet 3.)
   - If the temperature in the Heat Trap was warmer, put the dot in the appropriate box *above* zero on the chart.
   - If the temperature in the Heat Trap was cooler, put the dot in the appropriate box *below* zero on the chart.
2. If any fabric has not been tested at least once by someone in your group, have one or two students test it now. Record the data on the chart.

WET FABRICS IN STILL AIR

CHANGE IN TEMPERATURE (°C)	Cotton T-shirt	Cotton/Polyester Shirt	Wool Shirt	Wool Sweater	Cotton/Polyester Windbreaker	Plastic Raincoat
+1.0						
+0.5						
0						
−0.5						
−1.0						
−1.5						
−2.0						
−2.5						
−3.0						
−3.5						
−4.0						
−4.5						
−5.0						
−5.5						
−6.0						

WET FABRICS IN MOVING AIR

CHANGE IN TEMPERATURE (°C)	Cotton T-shirt	Cotton/Polyester Shirt	Wool Shirt	Wool Sweater	Cotton/Polyester Windbreaker	Plastic Raincoat
+1.0						
+0.5						
0						
−0.5						
−1.0						
−1.5						
−2.0						
−2.5						
−3.0						
−3.5						
−4.0						
−4.5						
−5.0						
−5.5						
−6.0						

3. Now determine the three best insulators under each condition and list them below.
   - The fabric that lost the least amount of heat (smallest drop in temperature) is the best insulator.

	WET FABRICS IN STILL AIR	WET FABRICS IN MOVING AIR
BEST INSULATOR		
SECOND BEST INSULATOR		
THIRD BEST INSULATOR		

Heat Traps
Technique Card

USING THE HAP STRIP THERMOMETER

How It Works

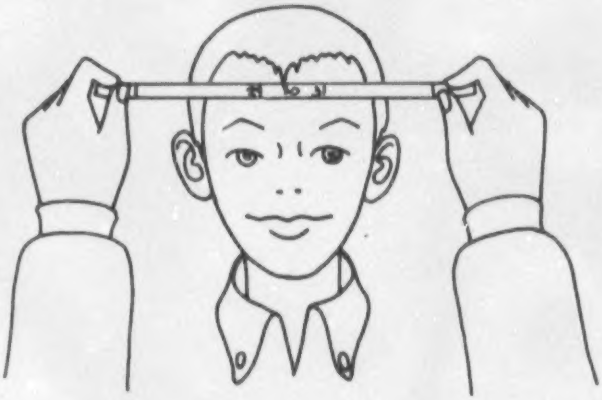
The HAP strip thermometer is made up of a series of encapsulated liquid crystals, each of which is optically active within a one-degree Celsius range; i.e., they go through visible color changes only within that specific range. The different crystals are encapsulated behind the strip numerals that indicate the particular one-degree ranges. As you hold the strip against an object, the numerals sequentially light up until the temperature indicated corresponds to the object's temperature. The actual temperature of the object is the highest numeral lit that does not change color for at least ten seconds.

The different color changes that each numeral goes through reflect fractions of a degree. The crystals behind a numeral change from black to tan to green-blue to violet-blue. If a numeral stays tan colored for at least ten seconds, the exact value of the numeral (e.g. 26) is the temperature of the object. Green-blue indicates a half degree more (e.g. 26.5). The violet-blue indicates that the next temperature (27) is almost reached. The next Celsius degree is reached when this next number turns tan. As various temperatures are passed, the numerals remain violet-blue.

Suggested Procedure

1. Work in pairs.

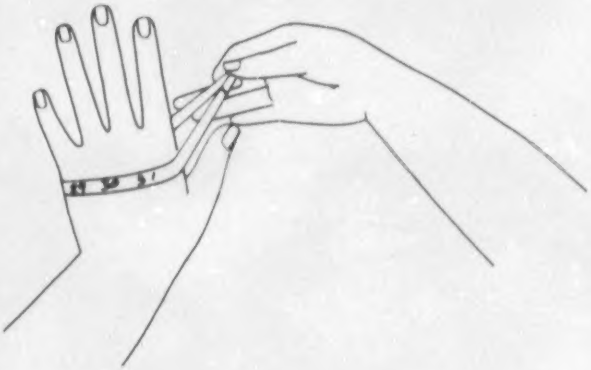
2. Using both hands, hold the strip by the orange tabs.



3. Press the strip, shiny side up, tightly against the surface of the object to be measured. (**Note:** Breathing on or touching the black portion of the strip will alter the temperature readings.)

4. As the numerals light up, slide the strip in one direction or the other so that the numeral currently lit is on the spot that you are measuring. Hold the strip firmly against the surface of the object until the highest numeral lit remains one color for at least ten seconds.

5. **The Loop Technique.** This technique is useful when you can use only one hand to hold the strip thermometer, e.g. when you are measuring the temperature of the back of one hand, the forearm, etc. Form a loop with the strip thermometer by holding the orange end tabs together with one hand. (The shiny side of the strip should be on the outside of the loop.) Insert your arm, foot, or leg through the loop. The loop should fit tightly against the part of the skin being measured.



Care of the Thermometers

1. To prolong the life of the strip thermometers, do not expose them to direct sunlight, extremely high temperatures, or rapid temperature changes outside of the range of the thermometer. The strips can withstand freezing, but should be warmed up slowly. The optimum storage temperature for these strip thermometers is between 13°C and 37°C.

2. *Brief* exposure to cold water will not harm the strip thermometers, but *do not* soak them in water or put them in warm water.

3. Do not put tape on the back of the strips as the tape markedly decreases the sensitivity of the strips. In addition, any attempt to pull the tape off will loosen the crystals and destroy their usefulness. If, however, the orange ends of the strips become loose, a little transparent tape will repair them. *Do not* bend the strips or scrape the back sides; such treatment loosens and destroys the crystals.

4. *Do not* use solvents such as alcohol or acetone; they will destroy the strips.

Heat Traps

Equipment Card

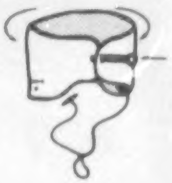
HEAT TRAP

MATERIALS FOR ONE HEAT TRAP:

1 curved tagboard strip
1 brass fastener
1 metal-tipped elastic band
1 HAP Strip Thermometer
1 rubber band

ASSEMBLING THE HEAT TRAP

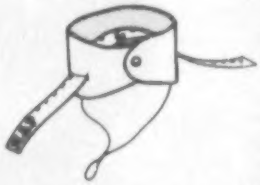
1. Bend the strip into a circle, overlapping the two ends so that the two small slits are aligned one on top of the other. Put the brass fastener through the small slits.



2. Poke the metal tips of the elastic band through the two holes below the large slits.

USING THE HEAT TRAP

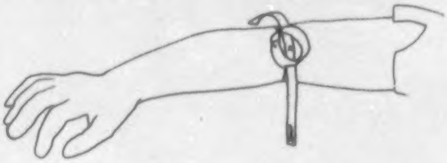
1. Carefully thread the HAP Strip Thermometer through the two large slits of the Heat Trap.



2. Wear the Heat Trap on the middle of your upper arm.

- Position the Heat Trap so that you can read the numbers on the Thermometer inside.
- Adjust the Heat Trap so that the curved edges of the Trap fit snugly against your skin.

3. When wearing the Heat Trap under clothing, have your partner tape the ends of the Thermometer together (underneath your arm) with a small piece of tape.



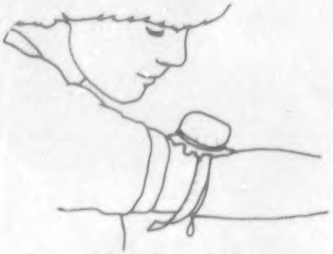
4. Check to see that the Heat Trap is properly applied.

- The Thermometer should not bulge up or sag down. Keep it taut.
- During the test, slide the Thermometer left or right so that you keep the lighted numerals in the center of the Heat Trap.

ATTACHING THE FABRIC

1. Center the piece of fabric over the opening of the Heat Trap.

2. Pull the edges of the fabric down around the Traps, and place the rubber band around the fabric-covered Trap.



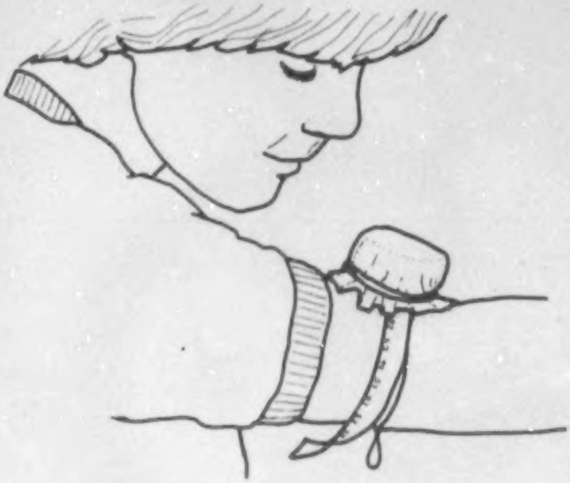
3. Push the rubber band down on the outside of the Heat Trap as far as possible.

4. Leave the fabric on the Heat Trap for two minutes.

- Avoid drafts.

5. After recording the temperature, let the air inside the trap return to its original temperature (about two minutes).

- Lifting the Heat Trap up and down speeds up the temperature return.



- Then, the partners help each other attach a fabric square to each of their Heat Traps.
- The students wait two minutes, and then have their partners remove the fabric and *immediately* read the highest numeral lit on the Thermometer.
- Each partner then records his results on his copy of Student Sheet 1.
- Explain to the students that they should wait for the air inside the Traps to return to normal before testing another fabric. (Lifting the Heat Trap up and down speeds up the temperature recovery.)

4. Let the students practice taking the temperature inside the Trap and testing one piece of fabric.

Testing Dry Fabrics

1. Take the students and the materials to the test site.

2. Ask the students to pair up and to form groups of four pairs.

- Each pair in a group will test four different fabrics.

3. Give each of the students a copy of Student Sheet 1, and have them record their predictions.

4. Distribute rubber bands and one pile of fabrics to each group of eight.

- Remind the groups that each pair gets four different fabrics to test. (There will be two pieces left over.)

5. Let the students test the fabrics on their Heat Traps.

6. After most of the students have completed their trials, distribute one copy of Student Sheet 2 to each group of eight students.

- Tell the students to summarize their group's data on this sheet.

7. If you have time, or some students finish early, let them test two layers of fabrics as described in the first HAP Sidetrip. (The students can record their results on the back of Student Sheet 1.)

Pooling the Data. Poll the groups to find out their choices for the three best dry-fabric insulators.

1. On the chalkboard, list the fabrics in order (best insulator first) in a column entitled "Dry Fabrics."

2. In case of ties or disputes, run a Heat Off between the contesting fabrics by testing them again.

3. Collect all the equipment.

THE ACTIVITY: PART TWO

Preparing for Part Two

1. Before the session begins, place eight squares of each kind of fabric in water.

2. At the beginning of the session, wring out the squares, and make four piles of fabric.

- Each pile should contain two pieces of each fabric.

3. Keep the dry fabric squares available for on-the-spot comparisons.

Introducing Part Two

1. Encourage the students to relate experiences in which their clothing got wet and to describe the effect of wet clothing.

2. Explain that you have dampened the fabric squares.

3. Ask the students to predict:

- how dampness will affect the ability of a fabric to trap heat.
- how dampness will change the order of the dry fabrics listed on the chalkboard.

Testing Wet Fabrics

1. Have the students form their original groups of eight.

2. Each student will choose one wet fabric and test its heat-trapping ability in still and moving air.
- Each group should test each of the fabrics at least one time.
- The students simulate moving air by walking around.

3. Give each student a copy of Student Sheet 3, and review the procedure on the Student Sheet.

4. Give each student a Heat Trap, a Thermometer, and some rubber bands. Give each group a pile of wet fabrics.

5. Let the testing begin.
- Provide extra copies of Student Sheet 3 for students who want to test more than one type of fabric.
- The students may have to dampen the fabrics if they dry out.

6. After most of the groups have tested each fabric at least once, give each group one copy of Student Sheet 4 on which to summarize their data.

Analyzing the Data

1. Poll the groups for the three best insulators in each category: "Wet in Still Air" and "Wet in Moving Air."
- List these in order (best insulator first) on the chalkboard.
- In case of ties or disputes, run a Heat Off.

2. Ask the students to look at the lists on the chalkboard and tell you how wetting a fabric affects its heat-trapping ability.
- Which fabrics are least affected by wetting? Most affected?

3. How do moving and still air affect a fabric's heat-trapping ability?

4. If any students tested two layers of fabrics, ask them to share their results.
- What general statements can you make about one layer versus two layers?

Cleanup. Allow the wet fabric squares to dry thoroughly on a flat surface before storing them or returning them to the kit.

HEALTH APPLICATIONS

1. You are planning to go on a week-long backpacking trip into the mountains. There is a good possibility that it will rain and be quite cold during the trip. What types of clothes should you pack? Why?

2. If you had to sit outside when the temperature was 0°C and there was a brisk wind blowing, how would you dress? How would you dress if you had to work in a 0°C meat freezer?

HAP SIDETRIPS

1. Build a better Heat Trap. Using the same procedure you used to test single layers of fabrics, test different combinations of two fabric layers.

2. Measure and compare the heat trapping abilities of different jackets, sweaters, and shirts by carefully putting a garment on while you are wearing a Heat Trap.

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